DOE/RL-2005-43
Rev. 1

Removal Action Work Plan for 105-N/109-N Buildings Interim Safe Storage and Related Facilities

United States
Department of Energy

Printed in the United States of America

DOCUMENT CONTROL 09/02/09 DP

DOE/RL-2005-43
Rev. 1

DOE-RL AND/OR REGULATOR APPROVAL PAGE

Title: Removal Action Work Plan for 105-N/109-N Buildings Interim Safe Storage and Related Facilities

Approval: R. F. Guercia
U.S. Department of Energy, Richland Operations Office

Signature ______ Date 8/5/09

F. W. Bond
Washington State Department of Ecology

Signature Frederick A. Bond ______ Date 8/5/09

DOE/RL-2005-43
Rev. 1

Removal Action Work Plan for 105-N/109-N Buildings Interim Safe Storage and Related Facilities

August 2009

United States Department of Energy

P.O. Box 550, Richland, Washington 99352

TABLE OF CONTENTS

APPENDICES

FIGURES

TABLES

ACRONYMS

ACM	asbestos-containing material
ALARA	as low as reasonably achievable
AOC	area of contamination
ARAR	applicable or relevant and appropriate requirement
BMP	best management practice
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CCRC	Centralized Consolidated Recycling Center
CFR	*Code of Federal Regulations*
CWC	Central Waste Complex
D4	deactivation, decontamination, decommissioning, and demolition
DOE	U.S. Department of Energy
DOH	Washington State Department of Health
DOT	U.S. Department of Transportation
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
Ecology	Washington State Department of Ecology
ERDF	Environmental Restoration and Disposal Facility
ETF	Effluent Treatment Facility
GPERS	Global Positioning Environmental Radiological Surveyor
HASP	health and safety plan
HEPA	high-efficiency particulate air
HGP	Hanford Generating Plant
ISMS	Integrated Safety Management System
ISS	interim safe storage
MEI	maximumally exposed individual
OSHA	Occupational Safety and Health Administration
OU	operable unit
PCB	polychlorinated biphenyl
PPE	personal protective equipment
RCF	Radiological Counting Facility
RCRA	*Resource Conservation and Recovery Act of 1976*
RL	U.S. Department of Energy, Richland Operations Office
ROD	record of decision
RWP	radiological work permit
S&M	surveillance and maintenance
SAP	sampling and analysis plan
SSE	safe storage enclosure
TBC	to be considered

Tri-Party	*Hanford Federal Facility Agreement and Consent Order* Agreement
TSCA	*Toxic Substances Control Act of 1976*
WAC	*Washington Administrative Code*
WIDS	Waste Information Data System

METRIC CONVERSION CHART

Into Metric Units			Out of Metric Units		
If You Know	*Multiply By*	*To Get*	*If You Know*	*Multiply By*	*To Get*
Length			**Length**		
inches	25.4	millimeters	millimeters	0.039	inches
inches	2.54	centimeters	centimeters	0.394	inches
feet	0.305	meters	meters	3.281	feet
yards	0.914	meters	meters	1.094	yards
miles	1.609	kilometers	kilometers	0.621	miles
Area			**Area**		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
Acres	0.405	hectares	hectares	2.47	acres
Mass (weight)			**Mass (weight)**		
ounces	28.35	grams	grams	0.035	ounces
pounds	0.454	kilograms	kilograms	2.205	pounds
ton	0.907	metric ton	metric ton	1.102	ton
volume			**Volume**		
teaspoons	5	milliliters	milliliters	0.033	fluid ounces
tablespoons	15	milliliters	liters	2.1	pints
fluid ounces	30	milliliters	liters	1.057	quarts
cups	0.24	liters	liters	0.264	gallons
pints	0.47	liters	cubic meters	35.315	cubic feet
quarts	0.95	liters	cubic meters	1.308	cubic yards
gallons	3.8	liters			
cubic feet	0.028	cubic meters			
cubic yards	0.765	cubic meters			
Temperature			**Temperature**		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity			**Radioactivity**		
picocuries	37	millibecquerel	millibecquerels	0.027	picocuries

1.0 INTRODUCTION

This document contains the removal action work plan (RAWP) for the interim safe storage (ISS) of the 105-N Reactor Facility and 109-N Heat Exchanger Building and deactivation, decontamination, decommissioning, and demolition (D4) of related ancillary facilities.[1] A list of the facilities addressed by this RAWP is presented in Table 1-1. These buildings, vaults, structures, and underground pipelines are located in the 100-N Area of the Hanford Site, which is owned and operated by the U.S. Department of Energy (DOE) and located in Benton County, Washington (Figures 1-1 and 1-2).

The 100-N Area was constructed and operated as a nuclear reactor facility to produce special nuclear materials and steam for electrical power generation. Past operations, disposal practices, spills, and unplanned releases have resulted in contamination of the facility structures, underlying soil, and underlying groundwater in the 100-N Area. Consequently, in November 1989, the 100 Areas (which includes 100-N Area) was one of four areas of the Hanford Site that were placed on the U.S. Environmental Protection Agency's (EPA) National Priorities List under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA). The Washington State Department of Ecology (Ecology) and the DOE, Richland Operations Office (RL), have determined that hazardous substances[2] in the facilities present a substantial threat of release that poses a risk to human health and the environment to the extent that a removal action[3] is warranted.

Alternatives for conducting a non-time-critical removal action were evaluated in the *Engineering Evaluation/Cost Analysis for the 100-N Area Ancillary Facilities and Integration Plan* (100-N Ancillary Facilities EE/CA) (DOE-RL 1998a) and in the *Engineering Evaluation/Cost Analysis for the 105-N Reactor Facility and 109-N Heat Exchanger Building* (105-N/109-N EE/CA) (DOE-RL 2004). These EE/CAs recommended deactivation followed by demolition for the 100-N ancillary facilities and ISS for the 105-N and 109-N facilities. The recommendations were approved in two action memorandums, *Action Memorandum for the 100-N Area Ancillary Facilities* (Ecology 1999) and *105-N Reactor Building and 109-N Heat-Exchanger Building Action Memorandum* (Ecology 2005a), signed by Ecology, the EPA, and DOE. The DOE is the agency responsible for implementing the removal actions in the 100-N Area. Ecology is the lead regulatory agency for facilities in the 100-N Area. This RAWP directs the implementation of the non-time-critical removal actions for the facilities listed in Table 1-1.

---

[1] The term "facility" is used generically to encompass all the surface and subsurface structures, buildings, foundations, piping, ducting, etc., associated with the facilities listed in Table 1-1.

[2] "Hazardous substances" means those substances defined by the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), Section 101(14), and includes both radioactive and chemical substances.

[3] "Remove" or "removal" as defined by CERCLA, Section 101(23), refers to the cleanup or removal of released hazardous substances from the environment; actions if a threat of release of hazardous substances occurs; actions to monitor, assess, and evaluate the release (or threat of release) of hazardous substances; the disposal of removed material; or other actions that may be necessary to prevent, minimize, or mitigate damage to public health or welfare or to the environment, which may otherwise result from a release or threat of release. If a planning period of at least 6 months exists before onsite actions must be initiated, the removal action is considered non-time-critical and an engineering evaluation/cost analysis (EE/CA) is conducted.

Table 1-1. 100-N Area Interim Safe Storage Facilities and Interim Safe Storage Ancillary Facilities.

Building No.	Building Name	WIDS Sites Expected to be Affected by D4 and ISS	Addressed in EE/CAs?	Radiological Status (If Documented)	Radiological Status Reference
100-N Area ISS Facilities[a]					
105-N	Reactor Building and Fuel Storage Basin	100-N-31, 118-N-1, 100-N-32, UPR-100-N-3, 100-N-38, UPR-100-N-7, 100-N-59, UPR-100-N-10, 100-N-66, UPR-100-N-12, 100-N-68, UPR-100-N-35, 116-N-4, UPR-100-N-39	Yes	RC-A	BHI 1998a
109-N	Heat Exchanger Building	100-N-37, UPR-100-N-7, 100-N-66	Yes	RC-A	BHI 1998a
100-N Area ISS Ancillary Facilities[b,c]					
105-NA	Emergency Diesel Enclosure	118-N-1, UPR-100-N-39, UPR-100-N-35, UPR-100-N-59	Yes	RC-N	BHI 2001
105-NE	Fission Products Trap	118-N-1, UPR-100-N-39, UPR-100-N-35, UPR-100-N-59	Yes	RC-A	BHI 1997a
116-N	Exhaust Air Stack	UR-100-N-9, UPR-100-N-14	Yes	RC-N	BHI 1995
117-N	Exhaust Air Filter House	None	Yes	RC-N	BHI 1995
1605-NE	East Observation Post (on top of 105-N)	None	Yes	NC	BHI 1995
1722-N	Decontamination Building	UPR-100-N-3, UPR-100-N-35, UPR-100-N-10, UPR-100-N-39, UPR-100-N-12	Yes	RC-N	BHI 2001

[a] Addressed by the *Engineering Evaluation/Cost Analysis for the 105-N Reactor Facility and 109-N Heat Exchanger Building* (DOE-RL 2004).

[b] Addressed by the *Engineering Evaluation/Cost Analysis for the 100-N Area Ancillary Facilities and Integration Plan* (DOE-RL 1998a).

[c] These facilities are not addressed in the *Removal Action Work Plan for the 100-N Area Ancillary Facilities* (DOE-RL 2006b).

D4 = Deactivation, Decontamination, Decommissioning, and Demolition
EE/CA = engineering evaluation/cost analysis
ISS = interim safe storage
NC = No radiological contamination. (See Section 1.4.1 for additional information.)
RC-A = Appreciable radiological contamination. (See Section 1.4.1 for additional information.)
RC-N = No appreciable radiological contamination. (See Section 1.4.1 for additional information.)
UPR = unplanned release
WIDS = Waste Information Data System

Figure 1-1. Hanford Site Map.

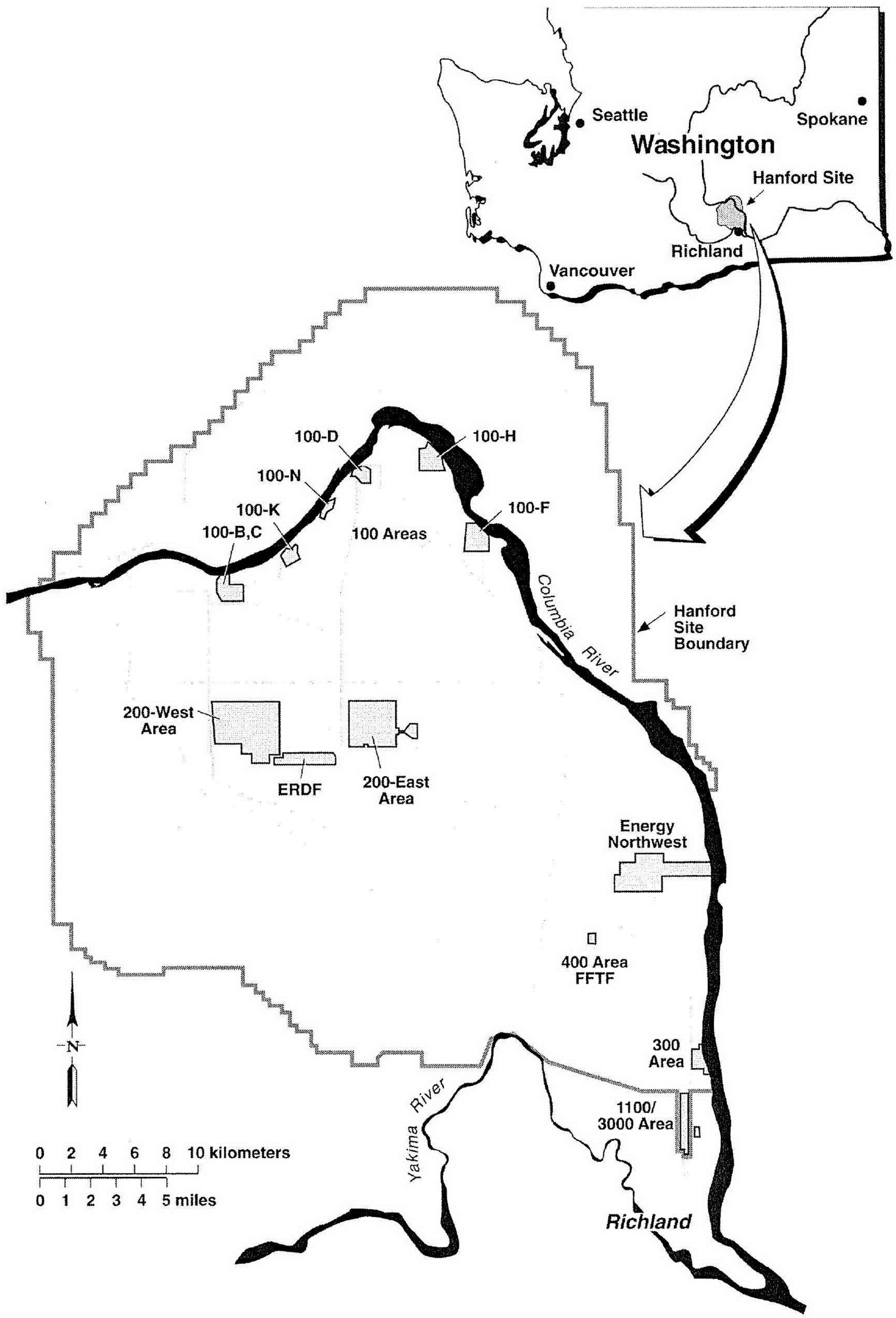
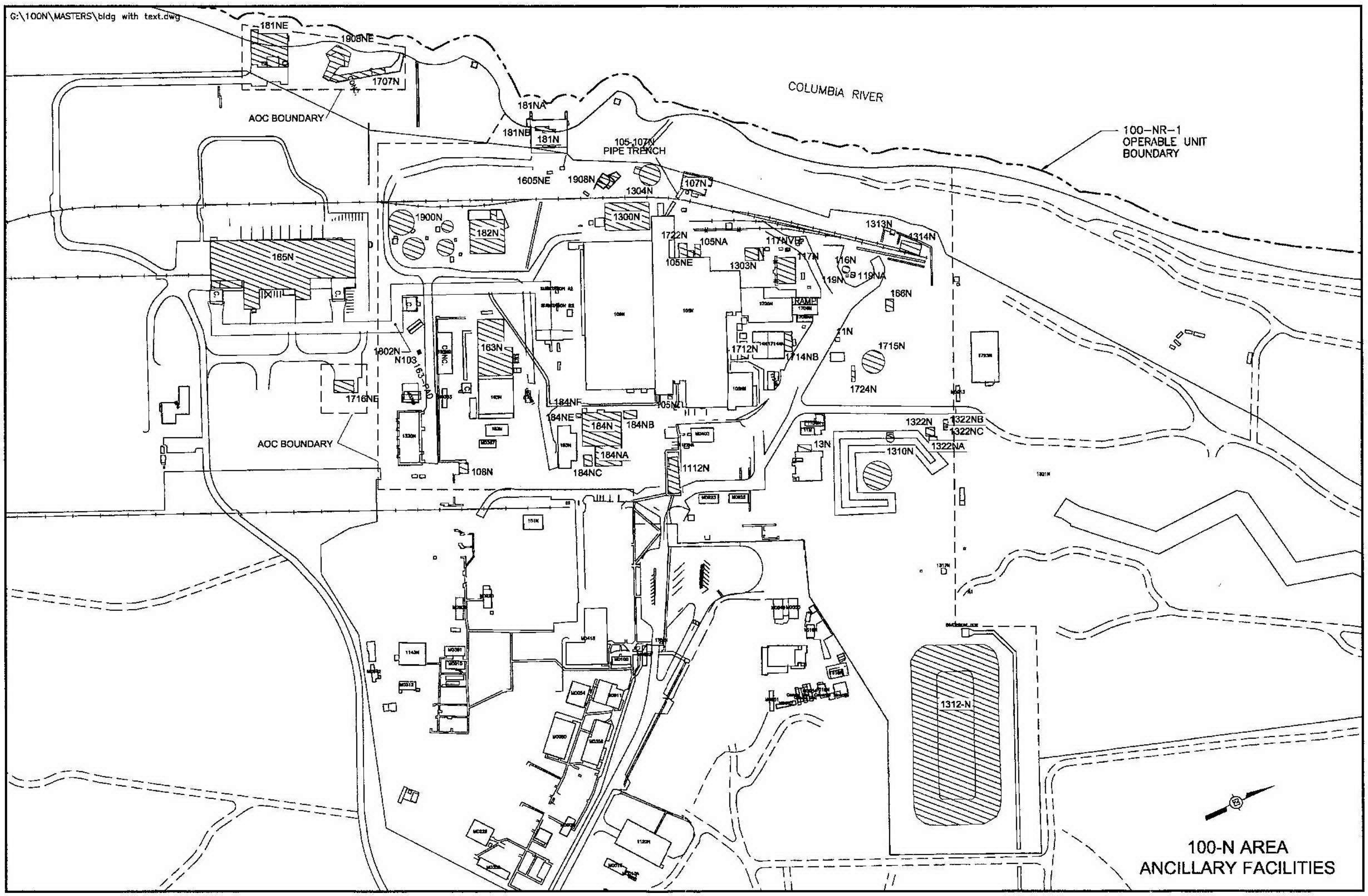


Figure 1-2. Portion of the 100-N Area Addressed by this Removal Action Work Plan.



1.1 PURPOSE AND OBJECTIVE OF THE REMOVAL ACTION WORK PLAN

The purpose of this RAWP is to establish the methods and activities required to perform the following functions:

- Modify structures as necessary and construct a safe storage enclosure (SSE) for the 105-N Reactor Facility and the 109-N Heat Exchanger Building
- Complete D4 of the portions of the 105-N and 109-N facilities located outside the SSE
- Complete necessary deactivation and isolation of systems and spaces inside the footprint of the SSE at 105-N Reactor Facility and 109-N Heat Exchanger Buildings
- Complete D4 of the six 100-N Area ancillary facilities affected by and directly related to the ISS of the 105-N and 109-N facilities
- Decommission groundwater and vadose zone wells, no longer required for service, encountered during D4 and ISS of the facilities in accordance with WAC 173-160
- Ensure impacted waste sites (e.g., french drains) within the footprint of the facilities are adequately defined and/or updated within the Waste Information Data System (WIDS)
- Manage and dispose of all waste generated during these actions.

This RAWP was developed in response to the requirement in the 105-N and 109-N action memorandum to submit a work plan to Ecology for approval prior to initiation of ISS activities (Ecology 2005a). This RAWP was prepared in accordance with Section 7.2.4 of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1989).

This RAWP implements the removal action activities including development of specific project tasks that are described in work packages and subcontract task orders. Using the most recent information concerning facility conditions, field-level work packages and subcontract task orders will be developed to direct work activities and instruct workers in the most applicable work methods. Existing contractor procedures and specifically developed instructions will be used to perform and control the facility removal and disposal actions.

The 100-N Area ISS facilities removal action schedule (see Appendix A), which encompasses the work scope through project completion, presents the logical progression of events and the estimated durations for each activity. Table 1-2 presents the Tri-Party Agreement milestones associated with the 100-N Area ISS facilities.

Table 1-2. Tri-Party Agreement Milestones Associated with the 100-N Facilities.

Milestone	Description	Due Date
M-16-55	Complete interim response actions for the 100-N Area	December 31, 2012
M-93-19	Submit to EPA and Ecology the 105/109-N Reactor interim safe storage design	Completed September 7, 2006
M-93-20	Complete 105-N Reactor interim safe storage	September 30, 2012
M-93-24	Submit engineering evaluation/cost analysis for 105-N Reactor interim safe storage	Completed September 1, 2004

Ecology = Washington State Department of Ecology
EPA = U.S. Environmental Protection Agency

1.2 OBJECTIVES

The primary goal of CERCLA removal actions is to minimize or eliminate threats to public health or the environment caused by the presence of hazardous substances. The EE/CAs for the 100-N Area facilities (DOE-RL 1998a, 2004) each presented three alternatives for future facility management and the resulting levels of protection of public health and the environment that may be anticipated. Based on the evaluation, D4 of the 100-N Area ancillary facilities and ISS of the 105-N and 109-N facilities were the recommended alternative.

These alternatives were chosen based on their overall ability to protect human health and the environment and their effectiveness in maintaining protection for both the short term and the long term. These alternatives would also reduce the potential for a release by reducing the inventory of contaminants. These alternatives provide the best balance of protecting human health and the environment, protecting workers, meeting the removal action objectives, achieving cost effectiveness, and providing an end state that is consistent with future cleanup actions and commitments to the Tri-Party Agreement (Ecology et al. 1989). The selection and approval of this approach is documented in the action memorandums (Ecology 1999, 2005a) for the 100-N Area facilities.

Placing the 105-N and 109-N facilities into ISS, along with the stabilization, complete or partial demolition, and disposal of the associated ancillary facilities, will reduce the potential hazards these 100-N Area facilities currently pose to public health and the environment. Waste products generated from the D4 and ISS activities will be segregated into a variety of waste streams, each of which will be disposed at appropriate disposal facilities.

Based on the potential hazards discussed in Section 1.4, the following removal action objectives were established in the 105-N/109-N EE/CA (DOE-RL 2004) and in the 100-N Ancillary Facilities EE/CA (DOE-RL 1998a):

- Control the migration of contaminants from the facilities to the environment

- Protect human receptors from exposure to contaminants in facility structures above acceptable exposure levels
- Facilitate remediation of 100-N Area waste sites in accordance with the *Interim Remedial Action Record of Decision for the 100-NR-1 Operable Unit, Hanford Site, Benton County, Washington* (100-NR-1 ROD) (EPA 2000)
- Prevent adverse impacts to cultural resources and threatened or endangered species
- Safely treat, as appropriate, and dispose of waste streams generated by the removal action
- Achieve applicable or relevant and appropriate requirements (ARARs) to the fullest extent practicable
- Support actions for the final disposition of the 105-N Reactor block
- Reduce the threat of release of hazardous substances contained within facilities
- Protect workers from hazards posed by these facilities
- Minimize or eliminate long-term surveillance and maintenance (S&M) requirements and associated costs
- Facilitate and be consistent with future remediation in areas where facilities are located.

The terms "closure" and "close out" are used synonymously throughout this document. The terms are used in CERCLA to describe when the waste management unit meets cleanup standards or other regulatory closure requirements.

1.3 SCOPE

The 100-N Area facilities included in the scope of this RAWP are as follows:

- 105-N Reactor Facility (including the N Fuel Storage Basin)
- 109-N Heat Exchanger Building
- 105-NA Emergency Diesel Enclosure
- 105-NE Fission Products Trap
- 116-N Exhaust Air Stack
- 117-N Exhaust Air Filter House
- 1605-NE East Observation Post (on top of 105-N)
- 1722-N Decontamination Building.

For the purposes of this RAWP, the eight facilities are collectively referred to as the 100-N Area ISS facilities. The last six are also referred to as the 100-N Area ISS ancillary facilities.

The demolition/removal of the reactor block inside of the 105-N Reactor Facility, the piping gallery and steam generator cells in the 109-N Heat Exchanger Building, and the penthouse structure surrounding the pressurizer tank are excluded from the scope of this RAWP. Deactivation and stabilization of these areas to support SSE installation and future surveillance and maintenance is discussed in Section 1.3.2.

Figure 1-2 illustrates the geographical boundaries of this action and shows the locations of the 105-N/109-N ISS work and the six ISS ancillary facilities within the 100-N Area. Figure 1-3 shows the floor plan of the 105-N Reactor Facility and the 109-N Heat Exchanger Building. Figure 1-4 shows the conceptual floor plan for the 105-N Reactor Facility/109-N Heat Exchanger Building SSE.

Mobile office trailers associated with the 105-N or 109-N facilities, or that will be used during the conduct of actions of this removal action will either be moved to different locations on the site and reused, or if determined contaminated or potentially contaminated, the trailers will be dispositioned in accordance with the 100-N Ancillary Facilities RAWP.

1.3.1 Cleanup Standards

In general, the goal of this removal action is to reduce the footprint of the 105-N/109-N SSE. The only materials of construction that are expected to remain in place are (1) those physically connected to the 105-N and 109-N facilities that cannot be removed without compromising the physical integrity of the SSE or (2) those that meet the cleanup criteria of the 100-NR-1 ROD (EPA 2000) or those below-grade structures approved to remain as described in Section 1.3.3.

1.3.2 Materials and Equipment Within the Safe Storage Enclosure

As noted earlier, the demolition/removal of structures and equipment within the SSE footprint shown in Figure 1-4 is excluded from this RAWP.

However, in order to provide assurances that hazardous and radiological contamination and equipment remaining within the SSE are stable (i.e., not available for migration or release to the environment during the surveillance period), and to protect the future S&M workers, the following general deactivation actions are anticipated.

a. Liquids will be removed to the extent practicable.

b. Electrical and instrumentation systems (except those installed for SSE S&M) will be de-energized.

Figure 1-3. Floor Plan of the 105-N Reactor Facility and 109-N Heat Exchanger Building.

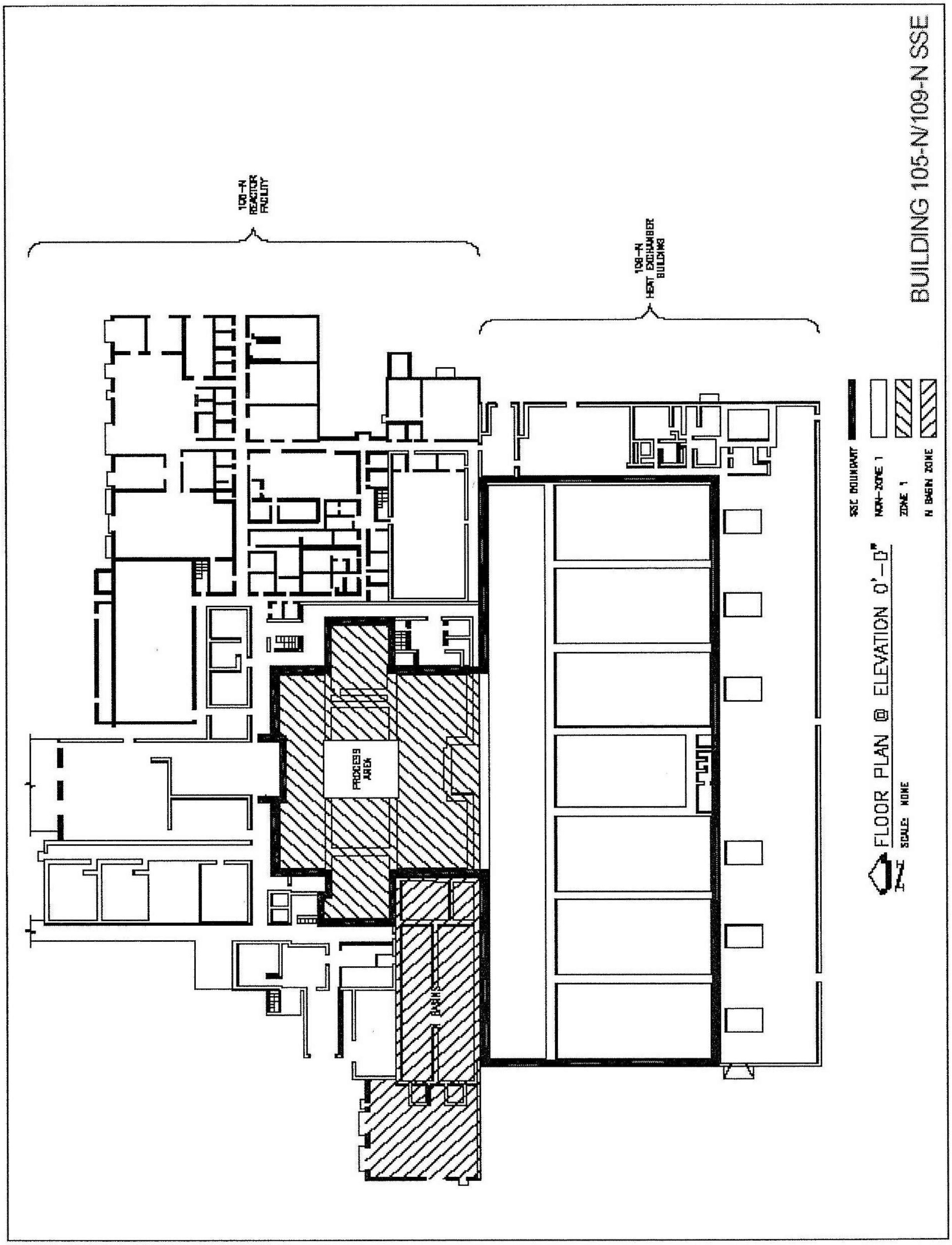
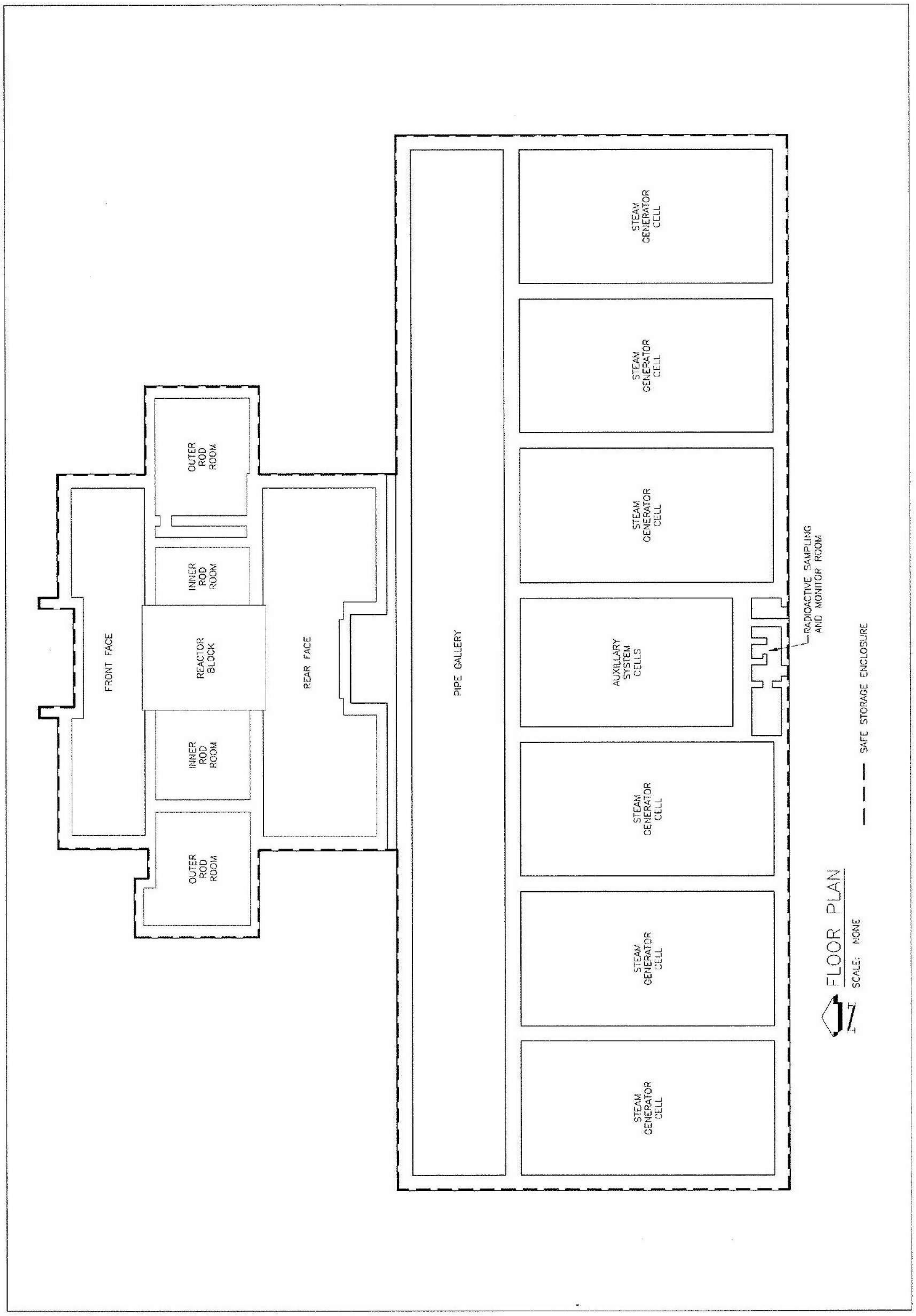


Figure 1-4. 105-N Reactor Facility/109-N Heat Exchanger Building Safe Storage Enclosure Conceptual Floor Plan.



c. Remaining friable asbestos or radiological contamination within the expected surveillance areas outside Zone 1 will be encapsulated or fixed to the extent practicable.

d. Loose lead (not installed or used for shielding) will be removed to the extent practicable.

e. Loose hazardous and housekeeping items will be removed as practicable.

f. Sludge, debris, equipment, and areas that could be a source of airborne contamination during the safe storage period will be stabilized or encapsulated.

In addition, anticipated steps to control known hazards and facilitate S&M are as follows:

a. Provide a filtered, passive ventilation path for Zone 1, to allow the structure to "breath" during changing weather conditions similar to filters installed at the other reactor blocks in ISS

b. Install a monitoring system for use during the safe storage period

c. Install tack welds in place of “high radiation area” padlocks on various Zone 1 entry points to eliminate periodic checks on the padlocks.

1.3.3 Below-Grade Structures

Below-grade structures will be addressed based on the condition of the structures and if any soil contamination site may be affected by the D4 activities. Below-grade structures will be removed to a minimum of 0.9 m (3 ft) below surrounding grade, and the remaining portion will either be removed or left in place, depending on whether the below-grade portion meets the cleanup criteria. Portions of the below-grade structures that are above cleanup levels will either be removed during facility demolition or deferred to the 100-NR-1 remedial action. Additionally, the below-grade structure may be left if it is believed that the removal of the structure could negatively impact a future remedial action. For example, leaving the basement floor in place over a waste site may be more protective to the waste site if removal of the floor would disturb the waste site such that additional stabilization or remediation could be required. Structures in contact with the 105-N/109-N ISS structures may be left in place if removal of the structures would compromise the integrity of the ISS structure. The decision to leave below-grade (as a general rule, “grade” is the top of the main foundation) structures shall be made on a case-by-case basis and requires the concurrence of the lead regulatory agency.

At the completion of the removal action, sites will be stabilized in a manner that allows for future remediation or closed in accordance with the soil cleanup values established in the 100-NR-1 ROD (EPA 2000).

1.3.4 Waste Sites Located Within the Proximity of the Removal Action Area

Some waste sites (e.g., french drains) may be located in close proximity to the facilities. During the course of this removal action the WIDS database will be updated to address any waste sites impacted or identified. If there is a desire to close a WIDS site, the site must meet the closure conditions of the 100-NR-1 ROD (EPA 2000).

1.4 FACILITY AND HAZARD DESCRIPTION

This section discusses the hazards in the 100-N Area ISS facilities included in this RAWP. The facilities addressed are limited to those facilities in Table 1-1. At this time, the facilities in this document have not been fully characterized for D4 and ISS activities; therefore, CERCLA hazardous substances have not been conclusively identified in all of the facilities. Facility hazard categorization will be performed in accordance with established procedures.

1.4.1 105-N Reactor Facility Description

The 105-N Reactor Facility (105-N) is a 4,000-megawatt (thermal) nuclear reactor designed to operate as a dual-purpose reactor. The reactor core is a graphite-moderated, light water-cooled, horizontal pressure-tube facility designed to produce plutonium. By-product steam was routed to the nearby 185-N Hanford Generating Plant (HGP). The 185-N HGP was a privately operated electrical generation facility that produce approximately 860 megawatts of electricity for use by the public (DOE-RL 1997).

Construction of the 105-N Reactor began in December 1959 and was completed in October 1963. The 105-N Reactor was the last of the nine Hanford Site graphite-moderated reactors. The facility contains the reactor block, front and rear elevators, pipe galleries, exhaust fans, a receiving basin for spent fuels, offices, control rooms, electrical and instrument rooms, a shop area, ventilation supply, metal preparation and storage areas, a fuel storage basin, and a transfer area. A below-grade exhaust ventilation duct connects 105-N with the 117-N Exhaust Air Filter House. On the south side of the building is the 109-N Heat Exchanger Building, which shares a common wall with 105-N. Asbestos, radiological, and chemical contamination exists in the 105-N facility.

The footprint of the 105-N facility is approximately 7,939 m^2 (85,450 ft^2) and includes three below-grade floor areas (minus 10-ft level, minus 16-ft level, and minus 21-ft level), a main floor area (0-ft level), and four above-grade floor areas (plus 15-ft level, plus 28-ft level, plus 40-ft level, and plus 60-ft level). The roof is at the plus 70-ft level and also includes a penthouse structure that extends to 24 m (80 ft) above grade. The reactor core and other primary reactor support areas are constructed of reinforced concrete and mass shield walls. Interior walls are composed of steel frame, concrete block (concrete masonry unit), and insulated panel construction. The exterior of the building is covered with insulated corrugated-metal wall panels. The roof is covered with built-up roofing with felt strips near the edges and overcovered with urethane foam and two sealer coatings.

The reactor core is composed of interlocking graphite bars containing zirconium-alloy pressure tubes, which held the zirconium alloy-clad uranium-metal fuel elements. Reactivity and reactor power levels were controlled using horizontal control rods and a vertical ball-drop system. Boron was the primary neutron-absorbing material used in the control rods and ball-drop system.

The irradiated reactor fuel was discharged to the 105-N Fuel Storage Basin (also called the N Basin) and placed into metal canisters. The fuel was cooled and stored in the basin to provide for radioactive decay of short-lived radionuclides before it was shipped for processing. The basin is an unlined, reinforced-concrete structure measuring 46 m (150 ft) long, 15 m (50 ft) wide, and 7 m (24 ft) deep.

Deactivation of 105-N was completed in 1998, which included shutdown and isolation of operational systems, cleanup of radiological and hazardous waste, inventory of remaining hazardous materials, sealing access areas, and securing the facility. Contaminated hardware and equipment, sludge, and water were removed from the fuel storage basin. Concrete cover blocks were placed over the fuel storage basin to provide shielding and isolation. Although the deactivation has been completed, portions of the building remain as high-radiation areas and airborne radiation areas. In addition, lubricating oils and/or hydraulic fluids remain in some pieces of equipment (BHI 1998c).

For management purposes, the 105-N Reactor Facility has been divided into three segments:

- **Zone 1 Segment.** This segment is defined as the ball control room; fuel cladding failure detection rooms; inlet and outlet piping rooms; gas condenser room; ball recovery room; C and D elevators; Ventilation Zone I supply plenum; Ventilation Zone I, II, and III exhaust tunnels; transducer room; corridor #3; inner and outer horizontal rod rooms; flux monitor room; front and rear faces of the reactor; reactor block/process area; Zone I ventilation exhaust fan room; supply crossover pipe space; top of reactor; machinery room; Ventilation Zone I and III ventilation exhaust duct; gas facility pipe tunnel; dryer rooms; and Ventilation Zone II ventilation exhaust fan room. Most, but not all, of the Zone 1 Segment will remain within the SSE for S&M following the work completion covered by this removal action.

- **Non-Zone 1 Segment.** This segment is defined as all other areas of the 105-N Reactor Facility that are not part of the Zone 1 Segment or the N Basin Segment.

- **N Basin Segment.** This segment is defined as the 105-N Fuel Storage Basin structure, which is composed of the superstructure and below-grade areas in the six main sections including north and south storage basins, examination pit, segregation pit, transfer area, and two cask pits, as well as the lift station pump well and valve box.

For a cross-reference to the related soil contamination areas (waste sites and unplanned release sites), refer to Table 1-1.

1.4.2 109-N Heat Exchanger Building Description

Construction of the 109-N Heat Exchanger Building (109-N) began in December 1959 and was completed in October 1963. The 109-N and 105-N facilities share a common wall. The 109-N facility is being considered with the 105-N ISS due to structural integrity concerns over separating the two facilities.

Reactor primary coolant from 105-N was circulated through the reactor to steam generators located in the 109-N facility and then routed back to the reactor via primary coolant pumps. Steam from the steam generators was either dumped into water-cooled dump condensers or piped to the HGP to generate electricity. Circulation of the highly radioactive reactor primary coolant through 109-N caused equipment, piping, and steam generators to be contaminated similar to levels within the 105-N Reactor equipment and piping. Tube leaks in the 109-N Heat Exchanger Building's steam generators allowed radiologically contaminated primary water to be carried to the HGP's secondary systems. The HGP (185-N) along with a portion of the 1802-N pipe trestle that leads to the 185-N Building was demolished in 2003.

The 109-N facility is located on the south side of 105-N immediately next to the building. The footprint of the building is approximately 8,406 m^2 (90,480 ft^2) and includes a below-grade floor area (minus 16-ft level), a main floor area (0-ft level), and two above-grade floor areas (plus 15-ft level and plus 24-ft level). The roof is at the plus 38-ft level and also includes a penthouse structure that extends to 24 m (80 ft) above grade.

The facility contains an auxiliary cell and six steam generator cells in parallel. Each steam generator cell contains two steam generators; a drive turbine; a circulating pump; and associated piping, valves, and instrumentation. Each steam generator is 17 m (57 ft) long by 3 m (10 ft) in diameter and weighs approximately 154 metric tons (170 tons). The 109-N Building includes a decontamination cell and a central penthouse area that contains a 13.5-m (44.5-ft)-high by 2-m (6.5-ft)-diameter pressure vessel weighing approximately 82 metric tons (90 tons).

The building is constructed of reinforced concrete with metal siding on the exterior and polyurethane roofing material over a 10-cm (4-in.) concrete slab. Interior walls are concrete block. The reinforced-concrete walls around the steam generator cells are approximately 1.5 m (5 ft) thick. The exterior of the building has eleven 1.8-m (6-ft)-diameter roof vents and the steam distribution headers and piping that routed pressurized steam to the 185-N HGP via the 1802-N pipe trestle.

Deactivation of the facility was completed in 1998, which included shutdown and isolation of operational systems, cleanup of radiological and hazardous waste, inventory of remaining hazardous materials, sealing access areas, and securing the facility. Although deactivation was completed, portions of the building (e.g., steam generator cells) remain as high-radiation areas and airborne radiation areas. The 109-N facility contains a large amount of asbestos and asbestos-containing materials (ACMs) that were used primarily for thermal insulation. In addition, lubricating oils and/or hydraulic fluids remain in some pieces of equipment (BHI 1998c).

For a cross reference to the related soil contamination areas (waste sites and unplanned release sites), refer to Table 1-1.

1.4.3 100-N Area ISS Ancillary Facility Descriptions

Descriptions of the 100-N Area ISS ancillary facilities included within this RAWP are provided in the following subsections. For a cross reference to the related soil contamination areas (waste sites and unplanned release sites), refer to Table 1-1.

105-NA Emergency Diesel Enclosure. The 105-NA Emergency Diesel Enclosure is a 17.9-m^2 (192-ft^2) pre-engineered metal-framed building that houses an emergency diesel-engine-powered pump designed to activate in case of a pipe break or fog-spray system activation in Radiation Zone 1 of the 105-N Reactor. Potential radioactive contamination exists within the piping system because the piping is affiliated with Radiation Zone 1 in the 105-N Reactor.

105-NE Fission Products Trap. The 105-NE Fission Products Trap, also known as the 1305-N Facilities, is a below-grade structure, of about 1.4 m^2 (15 ft^2). The reinforced concrete structure provides an approximately 9-m (30-ft)-deep "U-shaped" loop or trap for drain piping. Valves and drain pipes were attached to the bottom of each trap to allow for the drain-off of trapped solids. The intent was to trap fission products from the 105-N Reactor in the radioactive drain systems for disposal rather than for direct disposal to the 1301-N and 1325-N Cribs.

116-N Exhaust Air Stack. The 116-N Exhaust Air Stack (also called the Ventilation Stack) is a reinforced, monolithic, 69.5-m (228-ft)-tall structure that discharges ventilation exhaust to the atmosphere. It stands on an octangular-shaped below-grade base that measures 4.6 m (15 ft) at the top. It is fed by a below-grade air exhaust tunnel that originates in the 117-N Exhaust Air Filter House. Some attached piping is insulated with asbestos materials. The facility is believed to contain no appreciable radiological contamination.

117-N Exhaust Air Filter House. The 117-N Exhaust Air Filter House (also called the Ventilation Filter Facility) is a 399-m^2 (4,300-ft^2) reinforced concrete structure that housed the high-efficiency particulate air (HEPA) filter and activated charcoal filters used to remove radioactive particulates and iodine-131 from the exhaust air generated in the 105-N Reactor Facility. The filters are placed in banks that allow maintenance activities without affecting reactor operations. The facility also houses a water-spray system that automatically activates if a high-temperature excursion is detected. The roof panels are removable steel panels designed for remote filter-bank replacement. A below-grade exhaust duct connects the 105-N Reactor Facility with the 117-N Exhaust Air Filter House (117-N). An additional below-grade exhaust duct connects 117-N to the 116-N Exhaust Air Stack. The facility is believed to contain no appreciable radiological contamination.

1605-NE East Observation Post. The 1605-NE East Observation Post is an approximately 6-m^2 (64-ft^2) pre-engineered metal structure located on top of the 105-N Reactor Facility. It is believed that security used the facility. The facility is believed to have been constructed using ACMs.

1722-N Decontamination Building. The 1722-N Decontamination Building (also called the Decon Hot Shop) is a 12.2-m by 7.6-m (40-ft by 25-ft) single-story, metal-on-metal frame building on a concrete slab foundation. The building housed welding and mechanical tools to repair radioactively contaminated equipment. The facility is lightly contaminated, both radiologically and chemically, from the decontamination equipment and is believed to also be contaminated from spills and leaks resulting from the use and storage of miscellaneous solvents.

1.4.4 Facility Hazards

The hazards to the public, workers, and the environment for the 100-N Area ISS facilities are defined in the following documents:

- *Final Hazard Categorization and Auditable Safety Analysis for the 105-N/109-N Facility Interim Safe Storage Project* (WCH 2006)
- *105-NE Fission Products Trap and 1305-N Piping Preliminary Hazard Classification* (BHI 1997a)
- *Preliminary Hazard Classification for the 105-N Building Non-Zone 1 Segment* (BHI 1997b)
- *Auditable Safety Analysis and Final Hazard Classification for the 105-N Reactor Zone and 109-N Steam Generator Zone Facility* (BHI 1998a)
- *Final Hazard Classification and Auditable Safety Analysis for the N Basin Segment* (BHI 1998b)
- *100-N Ancillary Facilities Preliminary Hazard Classification* (BHI 2001).

1.4.4.1 Nonradioactive Hazardous Material Inventory. The 100 Area facilities have been deactivated, and all bulk chemical inventories have been removed for recycling or disposal. Some residual quantities of hazardous chemicals may remain in the process lines, tanks, and drains. Asbestos and lead are found in the greatest quantities and are located throughout the facilities. In addition, several types of hazardous materials remain in the 100 Area facilities, including the following:

- Asbestos
- Lead paint
- Lead shielding
- Polychlorinated biphenyls (PCBs) (e.g., light ballasts)
- Non-PCB light ballasts
- Mercury (in electrical switches, gauges, and thermometers)
- Refrigerants (e.g., Freon®)
- Lubricants and petroleum products (including used oil from motors and pumps)
- Corrosives
- HEPA filter media (desiccants)
- Fluorescent light bulbs

® Freon is a registered trademark of E.I. DuPont de Nemours & Company.

- Sodium vapor and mercury vapor lighting
- Water treatment products.

The removal of these materials will be performed in accordance with contractor procedures that ensure control over hazardous substances. The contractor's standards and procedures for asbestos and lead ensure that removing, handling, and disposing of waste is performed by personnel in a manner that achieves the following objectives:

- Protect the safety of employees and the general public
- Minimize spills and releases to the environment
- Meet applicable DOE, federal, state, and local regulatory requirements.

1.4.4.2 Radiological Material Inventory. Radionuclide inventories may be found in areas of the 100-N Area ISS facilities. Inventories are contained in nuclear safety documents. At most of the facilities, the activities of individual isotopes are not currently known, but will be determined as needed through sampling prior to disposal.

Key radionuclide contaminants are transuranics (e.g., plutonium-239 and americium-241), mixed fission products (e.g., strontium-90 and cesium-137), and activation products (e.g., carbon-14, cobalt-60, and nickel-63). Contaminants are most likely to be contacted as adherent films and residues encrusted in or on deactivated process equipment, piping, and ventilation system ductwork.

Three of the facilities in the scope of this RAWP are considered to have an appreciable radiological inventory: 105-N, 105-NE, and 109-N. Hazard categorization will be conducted in accordance with established procedures to support the ISS and D4 removal work.

1.4.5 Hazardous Substance Inventory, Management, and Protection

The hazardous substances within these structures will be managed in accordance with as low as reasonably achievable (ALARA) considerations, the applicable requirements provided in Section 4.1, and the waste management plan (Section 4.2) of this RAWP. Compliance with hazardous material protection requirements is ensured as described in the contractor's operating procedures.

1.4.5.1 Radiological Materials in the 100-N Area ISS Ancillary Facilities. The 100-N Area ISS ancillary facilities are posted as radiologically controlled areas. The radioactive materials contained in the 100-N Area ISS ancillary facilities are listed in the 100-N Ancillary Facilities EE/CA (DOE-RL 1998a). In general, the primary contaminants of concern are the following radionuclides:

- Transuranics (plutonium-239 and americium–241)
- Fission products (cesium-137 and strontium-90)
- Activation products (cobalt-60, carbon-14, and nickel-63).

1.4.5.2 Radiological Materials in the 105-N Reactor Facility and the 109-N Heat Exchanger Building. The radioactive materials contained in the 105-N Reactor Facility and in the 109-N Heat Exchanger Building are listed in the 105-N/109-N EE/CA (DOE-RL 2004). In general, the primary contaminants of concern are the following radionuclides:

- Tritium (H-3)
- Carbon-14
- Cobalt-60
- Nickel-59, nickel-63
- Strontium-90
- Technetium-99
- Cesium-137
- Europium-152, europium-154
- Plutonium isotopes
- Americium-241.

The area in the 105-N Facility with the greatest inventory of radionuclide contamination is the reactor block. The other areas (i.e., Zone 1 Segment [excluding the reactor block], Non-Zone 1 Segment, N Basin, and the 109-N Heat Exchanger Building) are radioactively contaminated, although to a significantly lesser extent. It is estimated that the radionuclide inventory for these other areas is less than 1% of the total inventory of the 105-N Building (BHI 1997b, 1998a, 1998b).

1.4.5.3 Lead. Lead may exist in surface coatings (i.e., lead-based paint), plumbing, and as radiological shielding (e.g., lead shot, brick, sheet and cast-lead forms) inside some of the 100-N Area ISS facilities. Workers performing job tasks that involve lead shall follow the applicable requirements in the contractor's procedures and the associated work package.

1.4.5.4 Asbestos. Asbestos-containing material is found in and around the facilities and may exist as vessel or piping insulation, floor tiles, transite wall coverings or panels, sheetrock, electrical wire insulation, and ducting. Visible dust will be prevented from activities associated with asbestos removal activities. Personnel involved in asbestos cleanup will follow the applicable requirements of 29 *Code of Federal Regulations* (CFR) 1926.1101, "Asbestos." Task-specific requirements will be contained within the associated work package.

1.4.5.5 Biological Hazards. Biological hazards are common to many of the facilities contained in this RAWP. Examples of biological hazards include bird and rodent carcasses and feces. Biological hazards will be identified as part of the S&M and facility demolition process.

1.4.5.6 Chemicals. It is believed that bulk chemical inventories have been disposed or recycled during deactivation of many of the facilities; however, the potential exists for the discovery of old containers of residual chemical constituents (e.g., solvents, greases, hydraulic and fuel oils, and aerosols). If such containers are found, the appropriate Environmental Health and Safety professional will be notified and specific management instructions will be provided to personnel.

1.4.5.7 PCBs. PCBs are identified as potential contaminants in the 100-N Area facilities, and PCB-contaminated waste will likely be generated. The various waste matrixes that may contain PCBs include PCB oils, PCB solids in paint, PCB remediation waste, and PCB-contaminated items.

1.4.5.8 Mercury. Mercury could be present in electrical equipment or in drain lines and traps. At certain levels, mercury is regulated as a dangerous waste. Waste containing mercury above regulatory limits will require treatment prior to disposal. The expectation is that most (if not all) mercury waste will be treated by amalgamation within the boundary of the removal action.

1.4.5.9 Refrigerants. Refrigerants are regulated due to their effect on the ozone layer of the atmosphere. Refrigerants will be "recovered" prior to disposal of the equipment.

1.4.5.10 Lubricants. Lubricants sometimes contain hazardous substances. Equipment will be drained of lubricants to the extent practical prior to disposal.

1.4.5.11 Corrosives. Corrosives may be present in facilities that have not been deactivated. In the State of Washington, corrosive solids and liquid waste above the regulatory limits must be managed, treated, and disposed of as a dangerous waste.

1.4.5.12 HEPA Filter Media. HEPA filter media may contain toxic metals above the regulatory limits. HEPA filters may need to be sampled prior to disposal to demonstrate whether (or not) they contain toxic metals above the regulatory limits.

1.4.5.13 Sodium Vapor and Mercury Vapor Lighting. Sodium vapor and mercury vapor lighting will be dispositioned through the Centralized Consolidated Recycling Center (CCRC) whenever possible. Sodium and mercury above a certain concentrations are regulated as a dangerous wastes under *Washington Administrative Code* (WAC) 173-303.

1.4.6 Facility Hazard Categorization

A facility hazard categorization, which is required for DOE facilities in accordance with DOE-STD-1027-92 (DOE 1992), was conducted in accordance with the contractor's hazard categorization procedure. The results are documented in WCH-26.

The categorization of the 100-N Area ISS facilities is below nuclear category 3. A final hazard categorization and auditable safety analysis was developed for the 100-N Area ISS facilities. See BHI (1997b, 1998a, and 1998b) for additional details regarding the 105-N and 109-N facilities hazard classification prior to the start of D4 and ISS activities.

The auditable safety analyses for the 100-N Area ISS facilities will also be revised when the ISS project is completed, consistent with the hazard and mission requirements for long-term S&M (up to 64 years).

2.0 REMOVAL ACTION ELEMENTS

2.1 REMOVAL ACTION WORK ACTIVITIES

The following subsections provide a general description of how work activities will be performed as part of the ISS activities and D4 of related ancillary facilities at the 100-N area. The general scope of work involved to implement this removal action includes the following activities:

- Performing S&M activities prior to, during and following the work described herein until an S&M Plan for the SSE is in place.
- Performing waste characterization sampling and analysis.
- Performing site mobilization and preparation activities.
- Removing hazardous substances (chemical, radiological, and biological) from demolition areas as needed to support open air demolition and waste management of demolition debris; removal or stabilization of these materials from areas within the SSE.
- Performing deactivation activities.
- Removing facility equipment and miscellaneous piping as needed to support open air demolition and waste management of demolition debris.
- Dismantling or demolition of various facility structures.
- Constructing the SSE.
- Disposing of waste (including S&M activities prior to D4 and ISS activities).
- Documenting remaining conditions and stabilizing the site (if final closure is not pursued). Documentation may including sampling and analysis.
- If final closure is pursued for the site, performing verification sampling and analysis. If verification sampling demonstrates that the site is at or below cleanup levels for concrete structures and soils (as applicable), preparing closeout documentation.
- Demobilization.

The scope of work will be accomplished by completing the activities described in the following subsections.

2.1.1 Surveillance and Maintenance

The goal of the long-term S&M is to sustain a facility in a safe condition and reduce the potential release or migration of hazardous materials to the environment. S&M activities are applicable to facilities prior to demolition and will also apply to the SSE following completion of this removal action. The S&M measures include routine radiological and hazard monitoring of a facility, safety inspections, and maintenance activities necessary to keep the facility in a safe condition and any remaining hazards contained. The S&M activities are tailored to the specific conditions of the facility. Waste generated during this period shall be evaluated for disposal at the Environmental Restoration Disposal Facility (ERDF). Waste generated during the S&M period sometimes does not require or is not eligible for disposal at ERDF. Examples include, but are not limited to, "replacement in kind" items such as light bulbs or trash that do not contain CERCLA hazardous substances. It is expected that most waste generated during S&M activities will meet the acceptance criteria for ERDF.

An S&M plan will be developed for the 105-N/109-N SSE near the end of this removal action to meet the requirements and expectations of Section 8 of the Tri-Party Agreement (Ecology et al. 1989).

2.1.2 Characterization Sampling and Analysis

Characterization is necessary to support waste disposal activities, to define contaminants present before or after the completion of the removal action, and in some cases to support site closure documentation.

Waste characterization documents produced to support this removal action include the development of the *DQO Summary Report for 105-N/109-N Interim Safe Storage Project Waste Characterization* (WCH 2005a), *Sampling and Analysis Plan for the 105-N/109-N Interim Safe Storage Waste Characterization* (DOE-RL 2006c), and the *Data Quality Objective Summary Report for Waste Characterization of the 100-N Ancillary Facilities and 190-DR Building* (BHI 2003), which was used as an input to the *100-N Ancillary Facilities Waste Characterization Sampling and Analysis Plan* (DOE-RL 2007).

Waste characterization will be conducted prior to and during D4 activities, as needed. Facility-specific historical information will be used to identify which waste streams are expected to be generated; the initial characterization data needs; and the rationale, strategy, and requirements for the data collection and analysis. Data collection may include survey and sample data. The initial characterization data will be used to:

- Characterize waste for treatment and/or disposal
- Identify radiological and hazardous conditions that will be encountered during D4, or
- Specify health and safety requirements.

In-process sampling will also be performed as necessary to characterize unexpected waste materials encountered during D4 of the facilities.

At this time, it is expected that most of the characterization activities conducted to support waste site closure will be performed as part of the 100-NR-1 work. When applicable, the *100-N Sampling and Analysis Plan for CERCLA Waste Sites* (DOE-RL 2007) and the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP) (DOE-RL 2005) established under the 100-NR-1 work scope will be used in cases where it is appropriate to demonstrate that a waste site is below the desired cleanup levels. Final site characterization sampling will be performed during site completion as described in Section 2.6.

2.1.2.1 Characterization for Potentially Contaminated Facilities. Some of the facilities listed in Table 1-1 are considered to be potentially contaminated. Prior to performing D4 of the facility, an evaluation of the following information will be performed:

- Facility history (e.g., what the building was used for, construction materials)
- Potential for radiological contamination from outside sources (e.g., biological intrusion)
- Radiological and industrial hygiene surveys performed in the facility
- Characterization data, as appropriate
- Criteria for disposal to an offsite disposal facility.

2.1.3 Site Mobilization and Preparation Work

Upon initiation of D4/ISS activities, personnel will be mobilized and required equipment and materials will be procured. The first activities to be performed will include mobilizing manual personnel and trailers to support project activities. Field support personnel will also terminate and/or verify termination of the 100-N Area ISS facilities services and utilities, as appropriate. Electrical systems that will be used throughout the D4 and ISS activities are discussed in further detail in Section 3.4.

Concurrent with these activities, waste storage areas will be set up within the area of contamination (AOC) or within the onsite location outside the AOC to facilitate transportation of the material for recycling or disposal in accordance with this document. The AOC is defined in Section 4.3.2.1. Supervisor trailers, lunch trailers, change trailers, office trailers, mobile shower trailers, and restroom facilities will also be mobilized as required at the sites to prepare for D4 and ISS activities. Electricity will be connected from an outside line or generator, and temporary power and lighting will be installed as needed. Occupational Safety and Health Administration (OSHA) concerns (e.g., fall protection, guarding, and electrical) will be managed as the concerns are identified.

2.1.4 Deactivation and Stabilization of Equipment in the SSE

A graded approach methodology will be applied to deactivation and stabilization of the equipment and areas remaining within the SSE at the end of this removal action. Many of these areas are currently high radiation areas and current ALARA issues must be weighed against the potential for migration or release of hazardous materials during the S&M period following this removal action. The actions and means to accomplish the tasks listed here may require modification as final planning progresses to maximize worker safety, both the current worker and the future S&M worker.

In order to provide assurances that hazardous and radiological contamination and equipment remaining within the SSE are stable (i.e., not available for migration or release to the environment during the surveillance period) the following general deactivation actions are anticipated for systems and spaces that will remain in the SSE.

a. Liquids will be removed to the extent practicable from process and utility systems that remain within the SSE to prevent possible freeze/thaw spills and any contamination spreads from leaking systems. This action includes primarily water and oils. It should be noted that some liquids will remain due to inaccessibility and inability to drain; for instance even when the hydraulic oil system is drained from accessible locations, the oil in pistons for the C and D Elevators (within the SSE footprint) is inaccessible until the elevator rams and pistons are removed.

b. The original electrical and instrumentation systems will be de-energized as part of the demolition preparations for the surrounding 105-N/109-N building portions that will be demolished. Work lighting and power within the SSE footprint will be provided by temporary systems except that a surveillance lighting and power system is planned to be installed that can be energized for subsequent S&M entries.

c. Remaining radiological contamination and friable asbestos along the expected surveillance routes outside of Zone 1 will be removed, encapsulated or fixed to the extent practicable to minimize potential exposure to S&M workers in the future.

d. Loose lead (not installed or used for shielding) and other loose hazardous and housekeeping items will be removed as part of the final sealing efforts for the SSE. This effort will remove the accessible materials, but some of this material is expected to remain due to access and ALARA concerns. For example, it is not seen as prudent to expend 40 man hours and accept a 2 man-Rem dose to do general housekeeping in a room with a radiation level of 50 mrem/hr. However, in the same room, removal of eight blocks of unused lead and confirming that a liquid system is drained (total effort taking 1 to 2 hours) would be pursued.

e. Sludge, debris, equipment and areas that could be a source of airborne contamination during the safe storage period will be stabilized or encapsulated. The intent is not to remove all sources of potential airborne contamination, rather to address those areas or materials that, due to location, form of remaining material or total curie content of the materials, could present a significant source of airborne contamination. For example, de-water and grout any remaining sludge or debris in the C Elevator Pit and confirm that any remaining sludge or debris in the D Elevator Pit is encapsulated or otherwise stabilized.

In addition, anticipated deactivation steps for specific items are as follows:

a. Provide a filtered, passive ventilation path to allow Zone 1 and the graphite block to "breathe" during changing weather conditions. For previous SSE construction efforts this allowance for "breathing" was accomplished by installing a HEPA filter at a point where the graphite block can communicate with ambient air. For 105-N, this is planned to include an installation to allow both the sealed Zone 1 areas and the graphite block to breathe. This change in approach is needed to accommodate the Zone 1 area (a sort of containment) that did not exist at the previous reactors that were placed into ISS.

b. Install a monitoring system for use during the safe storage period to include temperature and liquid detectors

c. Install tack welds in place of "high radiation area" padlocks on various Zone 1 entry points to eliminate periodic checks on the padlocks. This or similar steps will be implemented to eliminate maintenance or checks within the SSE while showing equivalent compliance to regulations or orders.

2.1.5 Deactivation, Decontamination, Decommissioning, and Demolition (D4) Activities

The D4 activities will be conducted within the footprint of a given facility (although staging may occur in an onsite location within the 100-N Area). It is important to note when waste is moved outside the AOC because when waste leaves the AOC, the substantive requirements of the *Resource Conservation and Recovery Act of 1976* (RCRA) are applicable to any hazardous waste.

Prior to starting D4 activities, the presence of waste sites within the footprint of a given facility (i.e., 1.5 m [5 ft]) from the facility's foundation) or within the expected excavation area will be identified and documented. In general, work activities for D4 will begin by developing a baseline of the facility conditions. Biological cleanup, general housekeeping, and removal of hazardous materials may also be necessary. Fluids will be drained from piping and equipment. Overhead utilities and adjacent concrete and asphalt will be removed, as needed, to support demolition activities. Contaminated materials will be fixed in place. The interior portions of the building will be removed. The final activity will include the demolition of the structure. These activities will be managed in accordance with the contractor's procedures and work packages that address removing, handling, and disposing of these materials in a manner that protects the safety of employees and the general public, minimizes spills and releases to the environment, and meets regulatory requirements.

Friable and most nonfriable ACMs and presumed ACMs will be removed prior to demolition of the area, as appropriate. ACM typically consists of insulation for piping, floor tiles, and cement asbestos board. Insulation on piping will be removed as Class I asbestos work, and nearly all other ACM in the facilities will be removed as Class II (e.g., floor tiles and cement asbestos board). Asbestos work, air monitoring, and worker safety requirements will be performed in accordance with the applicable portions of 40 CFR 61.145, 40 CFR 61.150, and the contractor's procedures for ACM removal.

If alternate removal methods for friable asbestos are developed or if nonfriable asbestos is to be left in place during demolition, a certified industrial hygienist or licensed professional engineer who is also qualified as a certified *Asbestos Hazard Emergency Response Act of 1986*

(40 CFR 763) project designer shall evaluate the work area, projected work practices, and engineering controls and shall certify in writing that the planned control method is adequate and meets the requirements of 40 CFR 61.145 and 40 CFR 61.150.

Unattached, not-in-use, and accessible lead bricks and sheeting; PCBs (primarily in motor oils and light ballasts); mercury (primarily in lighting components and switches); and other hazardous materials will be removed and disposed as hazardous or mixed waste or will be recycled consistent with guidelines found in Section 4.2.

Most of the loose, accessible radiological contamination will either be removed or fixed in place, depending on the levels, accessibility, complex shapes (e.g., grating), and type of contamination found. Some of the equipment/piping will be removed, and loose contamination will be wiped or vacuumed with a HEPA filter-equipped vacuum. If loose contamination remains after the initial decontamination effort (unless the area will be inaccessible after completion of the removal project, or if the building configuration or conditions make removal of loose contamination impractical), the contamination may be fixed in place, as required. Removal of fixed contamination (radiological or chemical) will be performed using nonaggressive means (e.g., wiping or using decontamination solutions). Aggressive means of decontamination (e.g., scabbling, grinding, or other abrasive/mechanical means) are planned to be used only as necessary to maintain levels ALARA. Additionally, in situations where major source term still exists, but due to its location or configuration is not readily accessible a controlled density fill material such as grout or other similar material may be installed to stabilize the material and/or provide shielding to facilitate long term S&M of a remaining ISS structure (e.g., Zone 1), or demolition, as appropriate.

Water, fogging devices, or fixatives may be used to control dust generated from demolition activities. The amount of water used will be minimized to prevent ponding and runoff. Controls will be described in work controlling documents (e.g., work packages) and could include constructing berms around the demolition area or removing asphalt to allow water to infiltrate into the ground.

The facilities will be demolished using standard demolition techniques (e.g., excavator with a hoe-ram, a hydraulic shear with steel shear jaws, concrete pulverizer jaws or breaker jaws, a crane with wrecking ball, and/or controlled explosives). Metals will be segregated for salvage if economically feasible and if meeting DOE criteria for free release from radiological controls. The above-grade structures of the facilities will be demolished and disposed.

2.1.5.1 Below-Grade Structures. Below-grade structures will be addressed depending on the condition of the structures, how the physical integrity of adjacent structures is affected, and if any waste site(s) or groundwater monitoring well(s) is affected by the D4 or ISS activities. Integration with waste sites is discussed in Section 2.1.8.

In general, below-grade ISS and ISS ancillary facilities will be removed to a minimum of 0.9 m (3 ft) below surrounding grade. The portions of the below-grade areas of the ISS facilities and ISS ancillary facilities that meet the cleanup criteria and that do not interfere with future remediation efforts may be left in place. If a below-grade portion of the facility is left in place, a visual inspection of the concrete to verify there is no staining and a radiological screen (e.g., Global Positioning Environmental Radiological Surveyor [GPERS] or other appropriate radiological field screen) will be completed. If the radiological screen is clean and there is no staining, no sampling is required and D4 actions at the site are complete. If anomalies are identified during visual inspection or via radiological field screening, actions will be taken to remove the contamination (e.g., via scabbling) until screening verifies no contamination above cleanup criteria remains. Where anomalies were identified and removed, consultation with the lead regulatory agency to review field screening data (or in some cases sampling data, if necessary) and to concur with a determination that materials left in place meet all cleanup goals and that the below-grade structure(s) may be left in place, will be sought.

Portions of the below-grade structures and soils that are above cleanup levels will either be removed during facility demolition or deferred to the 100-NR-1 remedial action. If the removal of below-grade structure could affect the physical integrity of adjacent structures (e.g., the 105-N/109-N SSE), or could negatively impact a future remedial action, then that below-grade structure may, with approval of the lead regulatory agency, be left in place and removal/remediation deferred. The size of the excavated area needed to remove the below-grade structure will exceed the size of the footprint of the facility. Safety concerns and access issues may necessitate backfilling in and around the facilities prior to the site being closed out. In this circumstance, the remaining contamination will be documented in the WIDS database so that the information is available when the site undergoes final remediation.

In the event that large volumes of contaminated soil are encountered, other soil contamination sites are adversely affected by D4 or ISS activities, utilities of active facilities are impacted, or removal of contaminated soil inhibits D4 or ISS activities, the removal of contaminated soils may be deferred to future remedial action with concurrence of the lead regulatory agency. The sites will be stabilized in a manner that will not hinder future remediation. Future cleanup efforts of the facility (if necessary) or transfer of the removal action scope to later remedial action will be coordinated with and approved by the lead regulatory agency. Future cleanup efforts will occur at the same time that waste sites are addressed as part of the 100-NR-1 and 100-NR-2 Operable Unit (OU) remedial actions.

2.1.5.2 Equipment Decontamination. Decontamination that is necessary to allow removal of demolition equipment (e.g., trackhoe excavators, front-end loaders) from contamination areas, and waste truck decontamination will be accomplished using standard industry practices and best management practices (BMPs). One or more areas will be established within the AOC or in the onsite area at a location that may or may not have been previously contaminated to conduct additional or final decontamination. The location of the decontamination area or areas will be documented.

Gross equipment decontamination methods will be employed to remove loose contamination within the contamination area. Best management practices for gross cleaning and/or decontamination of heavy equipment and vehicles consist of using wipes and nonhazardous materials to remove loose contamination. Water may be used to clean equipment in the decontamination area; however, the use of large volumes of water will be minimized. Soaps, detergents, or other cleaning agents will not be added to the washwater. Pressure washing (if required) will normally be performed using cold water (however, hot water may be used to avoid icing). Wet grit blasting, grinding, or steam cleaning will be used only after other decontamination methods prove to be ineffective.

Spent decontamination water and associated contamination from the decontamination of equipment will be discharged to the ground within the decontamination area. The lead regulatory agency and RL will agree on a case-by-case basis whether (or not) a decontamination area shall be clean closed at the end of D4 and ISS activities or whether the final cleanup can be deferred to a later remedial action. Closeout of decontamination areas will be performed in accordance with the 100-NR-1 ROD (EPA 2000) prior to closeout of the project. Decontamination practices will be documented in the field superintendent's/craft supervisor's (as appropriate) daily logbook. Personnel responsible for equipment decontamination will be knowledgeable of the applicable requirements of this RAWP.

2.1.6 Fuel Storage Basin D4

It is intended, for the purpose of this removal action, that the total 105-N Fuel Storage Basin structure will be removed to the extent practical to meet cleanup criteria, except where removal could affect the physical integrity of adjacent structures (e.g., the 105-N/109-N SSE), or could negatively impact a future remedial action as discussed previously in Section 2.1.5.1. The fuel storage basin consists of the superstructure and below-grade areas in six main sections: north and south storage basins, examination pit, segregation pit, transfer area, two cask pits, and the lift station pump well and valve box.

The methods and means of achieving the objectives of the removal of the basin will be addressed in the contractor's demolition plan and other work controlling documents. The methods and approaches to deactivation, decontamination, and demolition will be in line with those previously discussed.

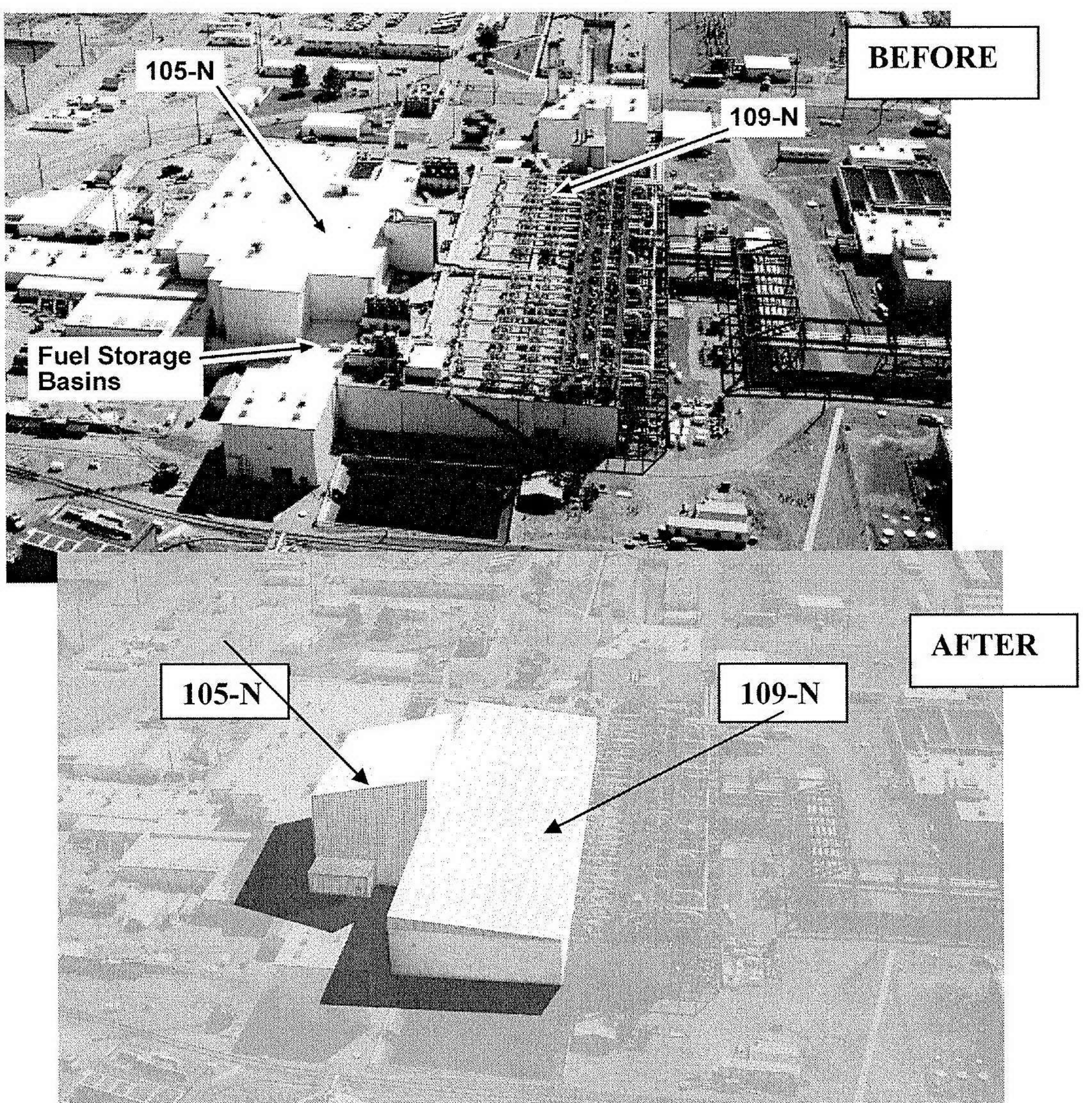
Prior to cover block removal, contamination within the fuel storage basin will be fixed in place (e.g., paint, fogging) in above- and below-grade areas. After contamination is fixed, grout or similar low-strength inert material will be added to further stabilize contaminants and/or provide shielding to support demolition. Demolition of the above-grade structure will be conducted using mechanized means. Demolition debris may be further size reduced and loaded out from the below-grade areas of the fuel storage basin. Material will be size reduced to fit into ERDF containers and meet the ERDF acceptance criteria. The demolition will utilize fixatives and dust suppression to mitigate potential fugitive emissions.

Because of the extent of excavation required to complete removal of the fuel storage basin, the possibility exists that backfill to the original grade may not be warranted. Additionally, access for SSE installation must be considered for any backfill decision. If cleanup criteria are met, the excavation will be backfilled to the extent necessary to contour the site with the natural contour of the 100-N Area. In the event that large volumes of contaminated soil are encountered and a decision is made to defer the site to future remedial action due to the proximity to the SSE or other considerations, the site will be stabilized in a manner that will mitigate industrial safety hazards and not unduly hinder future remediation. As such, a determination will be made on the appropriate level of backfill to stabilize the excavation area, and will be made as not to affect the physical integrity of adjacent structures (i.e., the 105-N/109-N SSE), any of these future decisions will be made in consultation with the lead regulatory agency.

2.1.7 Safe Storage Enclosure Construction

Following necessary deactivation, decontamination, and partial demolition of the 105-N Reactor Facility and the 109-N Heat Exchanger Building, the existing shield walls will be used to create an SSE, including a new or enhanced metal roof. The shield walls will support the roof, any openings/penetrations in the enclosure will be completely sealed, and remaining entrances will be welded shut. Other exposed SSE concrete surfaces will be left "as-is" upon completion of ISS work. A utility room will be used for access controls, monitoring equipment, and electrical power. Figure 1-4 shows the conceptual floor plan of the 105-N/109-N SSE. Figure 2-1 shows a graphical "before" and "after" representation of what the SSE will look like when completed.

Figure 2-1. 105-N/109-N Safe Storage Enclosure.



Key elements of the SSE design are as follows:

- Use existing 105-N and 109-N shield walls as the basis for establishing the SSE footprint and as prime components of the structure
- Remove exterior floors and decking to within the minimal acceptable distance of the wall for integrity of the remaining structure
- Seal all wall penetrations securely so penetration closures will not be dislodged in a seismic event or from wind loads
- Provide for limited, non-routine access into the SSE for S&M activities
- Address closure of all subsurface tunnels and pipes that will be left in place to prevent water or pest intrusion
- Allow for decontamination of equipment and structural components to the extent reasonable for radioactive and hazardous material volume reduction, ALARA practices, and, if practical, the release of material for unrestricted use.
- Provide a monitoring system for flooding and temperature monitoring

2.1.8 Waste Site Integration

The D4 and ISS activities will need to be integrated with the remediation of the 100-NR-1 and 100-NR-2 soils such that there are no negative impacts between the two efforts.

Wells may be located near or within the footprint of the structures undergoing D4 and ISS activities. The wells may or may not be affected by the D4 and ISS activities. If required to facilitate D4 and ISS, the wells will be decommissioned or protected as not to damage the integrity of the wells should their continued service be required following completion of D4 and ISS activities.

Other contaminated underground structures (including, but not limited to french drains, pipelines, pipe tunnels, and pipe trenches) may be exposed or affected by removing the below-grade facility structures. The condition of these sites will be documented as part of the D4 and ISS process. The documentation shall include location of pipelines/pipe tunnels/pipe trenches (as appropriate) that intersect the site as an aid to future remediation

If the D4 or ISS work results in the effective remediation of a site (e.g., removal of a french drain next to a structure), the closure of that site will be addressed as part of the D4 and ISS activities or deferred to a later remedial action following lead regulator concurrence. "Chasing" these other contaminated underground structures beyond the excavations will be evaluated on a case-by-case basis to determine the practicality of removing the structure as part of the D4 or ISS work scope or deferring removal to a later remedial action.

2.1.9 Waste Management and Disposal

The D4 and ISS activities will be conducted within the footprint of a given facility (although staging may occur within the AOC, or onsite area with Ecology concurrence); however, the size of the area needed to excavate soils and/or demolish structures will exceed the size of the footprint. When waste is moved outside the AOC (except as noted above), the substantive requirements of RCRA and WAC 173-303 are applicable to any hazardous or dangerous waste.

Waste management will include both S&M activities conducted prior to D4 and ISS activities as well as wastes generated during D4 and ISS activities. All waste management activities will be performed in accordance with waste management ARARs identified in the action memorandums for the 100-N Area facilities (Ecology 1999, 2005a) and this RAWP. Certain materials are eligible for salvage and recycling, which is encouraged if the appropriate regulatory and project requirements are met and it is economically feasible for the project to do so. It is believed that nearly all of the CERCLA waste from the removal action will be disposed at ERDF. The CERCLA waste from the removal action will be disposed at either the ERDF, the Central Waste Complex (CWC), or the Effluent Treatment Facility (ETF). The CERCLA waste may also be disposed at an offsite facility that has been approved by the EPA in accordance with 40 CFR 300.400. Treatment of waste may be necessary prior to disposal at the ERDF, and containerized waste may be sorted at the ERDF with lead regulatory agency (Ecology) and EPA concurrence while the waste is awaiting treatment.

If transuranic waste or mixed waste that cannot be sent to ERDF is encountered, storage (for eventual disposition) is allowed at the CWC per the approved offsite determination for this facility (EPA 2002). Waste sent to the CWC must meet the CWC acceptance criteria (FH 2006). Any contact-handled transuranic waste generated will be shipped to the Waste Isolation Pilot Plant for final disposition in accordance with this work plan and a schedule established for remedial actions, no later than September 30, 2024. Liquid waste will either be sent to the Hanford Site's ETF or treated to meet the acceptance criteria of the receiving facility. Liquid waste sent to the ETF will be treated separately from other non-CERCLA sources, and any treatment residues that meet ERDF waste acceptance criteria (WCH 2008a) may be disposed of at ERDF.

An interim step between load-out of the ERDF roll-off containers and disposal at ERDF is placement of the container in a queue. In most cases, the containers are in the queue for less than 24 hours. However, there is the potential for two additional waste streams to be generated while managing the waste. The first is water (e.g., from dust suppression or moisture in the air) found in an ERDF roll-off container. Containers are to be inspected for the presence of water prior to placing a liner or waste into the container. When water is found in a container with an estimated volume of 151 L (40 gal) or less (less than a depth of 1.3 cm [0.5 in.] in the bottom of the container), the water will be used for dust suppression in the adjacent radiological excavation, staging pile, or radiological debris pile in a manner that is consistent with regulator-approved work plans. When water is found in the container with an estimated volume greater than 151 L (40 gal), lead regulatory agency approval will be sought to use the water for dust suppression in the adjacent radiological excavation, staging pile, or radiological debris pile, or direction from the agency to process the water through other means.

The second waste stream is from leaking equipment (e.g., hydraulic fluid, diesel, oil). These spills are appropriate for ERDF disposal when the spill occurs from equipment supporting the CERCLA activity, the waste meets the ERDF waste acceptance criteria, and the spill occurred within the CERCLA onsite area. Waste will be managed in accordance with Section 4.2.3.

The EPA has provided its approval for sample waste generated as part of this removal action, which is shipped to Hanford Site laboratories for analysis, to be returned to the point of origin for disposal. The approval is documented within the *100-N Area ancillary Facilities Waste Characterization Sampling and Analysis Plan* (DOE-RL 2007) and the *Sampling and Analysis Plan for the 105-N/109-N Interim Safe Storage Waste Characterization* (DOE-RL 2006c).

2.1.10 Facility Completion

Facility completion will be pursued when there are no known waste sites underlying the building foundation, or if a small waste site is effectively remediated as part of the facility removal. When pursuing facility completion, a Facility Status Change Form (Appendix C) will be prepared to provide a summary of the completed actions, the as-left condition of the area, the characterization data collected during the removal action, and an assessment of the underlying soil. The form will be approved by DOE and Ecology to document completion of the removal action. The form and instructions for completing the form are provided in Appendix C. Approval of the Facility Status Change Form for ISS Ancillary facilities satisfies the requirements of a closure verification package per *Action Memorandum for the 100-N Area Ancillary Facilities* (Ecology 1999).

When there are no known waste sites underlying the building foundation, field investigation and a visual inspection will be performed to support facility completion. Field investigation results (e.g., radiological data generated during D4 or ISS) will be reviewed to determine that no radiological contamination exists in the soil or remaining below-grade structures (if present) and radiological surveys (e.g., GPERS) will be used to confirm no contamination remains. A visual inspection will be performed to confirm that there is no soil staining or anomalies present. Should the visual inspection identify anomalies in the soil, verification sampling will be performed in accordance with the *100-N Area Sampling and Analysis Plan for CERCLA Waste Sites* (DOE-RL 2006a). After investigation, inspections and data review indicate that no further remediation is necessary, the below-grade void spaces will be backfilled with clean soil. The area will be backfilled (approximately the top 0.6 to 1.0 m [2 to 3.3 ft, or where determined appropriate, in consultation with the lead regulatory agency, to match the contour of adjacent area]) to facilitate future revegitation of the site. The final grade of the site will match the contour of the surrounding terrain. Existing borrow pits will be used to obtain the backfill material.

Closure of any 100-NR-1 OU waste sites will be completed in accordance with 100-NR-1 remedial action documents as appropriate.

2.1.11 Site Stabilization (If Cleanup Standards Are Not Met)

If a site does not meet the 100-NR-1 OU cleanup standards following completion of the D4 or ISS activities, the site will be stabilized in a manner that will not hinder future remediation.

Should the decision be made to leave at- or below-grade structures in place, approval would be sought from the lead regulatory agency and DOE. This approval will be documented in a Facility Status Change Form to provide a summary of the completed action, the as-left condition of the area, the characterization data collected during the removal action, and a justification for leaving the at- or below-grade structures. The lead regulatory agency will be provided documentation describing the environmental conditions at the end of the D4 or ISS activity.

If, at the completion of D4 and ISS activities, in-process measurement or characterization indicates that the cleanup standards have not been met, the removal of contaminated soils may be deferred to future remedial action with concurrence of the lead regulatory agency. The site will be stabilized in a manner that will mitigate industrial safety hazards and not unduly hinder future remediation. Stormwater run-on and/or run-off issues will be addressed. Characterization information for the areas will be generated to document the status of conditions at the conclusion of D4 and ISS. S&M requirements will be established for the site. The WIDS database will be updated to reflect the condition of the site following the D4 and ISS activity. Additional data may be included in deferral documents. Final site restoration will be coordinated with remedial action.

2.1.12 Demobilization

At the completion of D4 and ISS activities, the trailers and equipment may be demobilized or turned over to personnel conducting the soil remediation work under the 100-NR-1 OU work scope.

In some cases equipment, including change rooms, shower trailers, office trailers, etc., may no longer be used due to levels of contamination or disrepair. In these instances, the equipment will be decontaminated, deactivated, demolished, and disposed in accordance with this RAWP under the removal action.

3.0 SAFETY AND HEALTH MANAGEMENT AND CONTROLS

3.1 EMERGENCY MANAGEMENT

The contractor's Emergency Management Program (including preparedness, planning, and response) contains the administrative responsibilities for compliance with the *Hanford Emergency Management Plan* (DOE-RL 2002) and applicable DOE requirements. The WCH Emergency Management Program establishes a coordinated emergency response organization capable of planning for, responding to, and recovering from industrial, security, and hazardous material incidents. Emergency action plans for contractor-managed hazardous facilities identify the capabilities necessary to respond to emergency conditions, provide guidance and instruction for initiating emergency response actions, and serve as a basis for training personnel in emergency actions for each facility. The emergency response actions within the emergency action plan are provided for recognizing incidents and/or abnormal conditions, initiating initial protective actions, and making the proper notifications. The emergency action plans are consistent with Hanford Site emergency procedures and meet the requirements of the *Hanford Emergency Management Plan* (DOE-RL 2002).

All emergency planning and preparedness activities for these projects will be consistent with planning and preparedness actions taken by other Hanford Site contractors and similar projects. Activities will be conducted in a manner that ensures the health and safety of workers and the public and the protection of the environment in the event of an abnormal incident during D4 and ISS of the 100-N Area ISS facilities.

3.2 SAFEGUARDS AND SECURITY

Access to the 100-N Area is controlled via personnel badging, postings (warning signs) and security patrols. Access and keys to 100-N Area ISS facilities are controlled by the contractor. Access requirements for employees and/or visitors are defined in contractor's procedures.

3.3 STRUCTURES, SYSTEMS, AND COMPONENTS TO PROTECT FACILITY WORKERS

Controls that will be employed during the 100-N Area ISS facilities removal project include temporary confinement enclosures, glovebag containments, and personal protective equipment (PPE), as directed by the work planning documents. To control emissions, vacuums will be equipped with HEPA and/or charcoal filters, and the exhausters will be equipped with HEPA filters. Radiological work permits (RWPs) and work packages specifically addressing the hazards associated with D4 and ISS activities will also be in place. Personnel monitoring and area monitoring will be used as required to determine and document worker exposures and work conditions.

Temporary confinement enclosures will be constructed as required to provide proper airflow conditions and will be fabricated of noncombustible and fire retardant materials. A standard type of temporary confinement is a glovebag enclosure, which will essentially be a one-time-use protective measure used to prevent contamination release during specific operations (e.g., pipe cutting and sample collection). Glovebags are available in a variety of sizes and designs and will be ordered to tailored specifications in accordance with their intended uses. Radiological containments will be evaluated and constructed in accordance with the contractor's procedure(s).

3.4 ELECTRICAL SYSTEMS

The removal of electrical systems is typically the last isolation activity performed during pre-demolition deactivation because power is needed to support the D4, SSE construction, and remediation activities. However, if the existing electrical systems pose a threat to workers (e.g., underground conduit interfering with an excavation or demolition), the electrical system would be deactivated first and alternate power supplies would be used. Alternative power will consist of either generators or a stand-alone power system separate from the facility.

3.4.1 105-N/109-N Interim Safe Storage (Up to 64 Years)

For supporting ISS of the 105-N/109-N facilities, the alternative temporary power system will be replaced by a reduced-capacity (National Electrical Code-compliant) permanent power system that will provide power within the SSE for surveillance activities for the safe storage period up to 64 years. The S&M activities have lower power demands than D4 and ISS activities that allow a much reduced power supply system. The S&M power system will consist of a transformer providing 120/240 volts (approximately 5 kVA) to lighting panels and outlets to power monitoring instruments. All power and instrument wiring is accomplished using flexible conduit. Some consideration may be made to re-use existing components or lighting systems, but this will be done on a case-by-case basis and is expected to be of minimal scope.

3.5 HEALTH AND SAFETY PROGRAM

3.5.1 Worker Safety Program

The contractor's Hazardous Waste Operations Safety and Health Program is developed for employees involved in hazardous waste site activities. The program is developed to comply with the requirements of 29 CFR 1910.120 and 10 CFR 835 to ensure the safety and health of workers during hazardous waste operations. The Integrated Safety Management System (ISMS) will be incorporated into all work activities. The program includes the following elements:

- Organizational structure that specifies the official chain of command and the overall responsibilities of supervisors and employees

- Comprehensive work plan developed before work begins at a site to identify operations and objectives and to address the logistics and resources required to accomplish project goals

- Development of a site-specific health and safety plan (HASP) when workers may be exposed to hazardous substances
- Worker training commensurate with individual job duties and work assignments
- Medical surveillance program administered to comply with the OSHA requirements (29 CFR 1910.120)
- Contractor's procedures and project/task specific implementing plans and procedures
- Voluntary Protection Program.

3.5.2 Health and Safety Plan and Activity Hazards Analysis

The *Health and Safety Plan for 100 Area D4 Projects* (HASP) (WCH 2005b or current revision) defines the chemical, radiological, and physical hazards and specifies the controls and requirements for work activities. Building access and work activities are controlled in accordance with approved work packages, as required by established contractor procedures. The HASP addresses the health and safety hazards of each phase of site operation and includes the requirements for hazardous waste operations and/or construction activities, as specified in 29 CFR 1910.120. Depending on the specific hazards present, one or more HASP(s) will be written for D4 and ISS of the facilities. As part of work package development, a hazards analysis will be written to identify the hazards associated with specific tasks not already covered under a HASP. The elements included in the HASP are as follows:

- A general overview of the hazards associated with the facility or facilities and the appropriate actions necessary to mitigate the hazards
- List of employee training assignments
- List of PPE to be used by employees at the work site
- Medical surveillance requirements
- Work site control measures including how to address "changed conditions"
- Emergency response
- Confined space entry procedures
- Spill containment program.

In addition to the HASP, a RWP will be prepared for work in areas with potential radiological hazards. The RWP extends the Radiological Protection Program (discussed in Section 3.5.3) to the specific work site or operation. All personnel assigned to the project and all work site visitors must strictly adhere to the provisions identified in the HASP and RWP.

Before work and each activity begin, a pre-job briefing will be held with the involved workers. This briefing includes reviews of the hazards that may be encountered and the associated requirements. Throughout an activity, daily briefings may also be held as well as special briefings prior to major evolutions.

3.5.3 Radiological Controls and Protection

The Radiological Controls and Protection Program is defined in DOE-approved programs and contractor-approved procedures. The Radiological Controls and Protection Program implement the contractor's policy to reduce risks to safety or health risks to levels that are ALARA and to ensure the adequate protection of workers. The contractor's Radiological Protection Program meets the requirements of 10 CFR 835. Appropriate dosimetry, RWPs, PPE, ALARA planning, periodic surveys, and radiological control technical support will also be provided.

The standard contractor's controls for work in radiological areas are assessed as adequate to control project activities. These controls provide for radiological controls planning to identify the specific conditions, and the controls also govern the specific requirements for an activity, periodic radiation and contamination surveys of the work area, periodic or continuous observation of the work by the Radiological Controls organization, and procedures to follow in the event that conditions outside the controls (i.e., changed conditions) are encountered. The ALARA planning process will be used to identify shielding requirements, contamination control requirements (including local ventilation controls), radiation monitoring requirements, and other radiation control requirements for the individual tasks conducted during the projects.

Measures are also taken to minimize the possibility of releases to the environment. The air monitoring section of this document (see Appendix B) addresses the radionuclide inventory and activities that could cause potential release of this inventory, but not to the exclusion of 10 CFR 835 requirements.

4.0 ENVIRONMENTAL MANAGEMENT AND CONTROLS

4.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

40 CFR 300.415(j) requires that ARARs be met (or waived) to the extent practicable during the course of removal actions. When requirements are identified, a determination must be made as to whether those requirements are applicable or relevant and appropriate. A requirement is applicable if the specific terms (or jurisdictional prerequisites) of the law or regulations directly address the circumstances at a site. If not applicable, a requirement may nevertheless be relevant and appropriate if (1) circumstances at the site are, based on best professional judgment, sufficiently similar to the problems or situations regulated by the requirement, and (2) the use of the requirement is well suited to the site.

ARARs include only substantive requirements of environmental standards. ARARs do not include administrative requirements, including requirements to obtain any federal, state, or local permits (40 CFR 300.400[e] and CERCLA 42 U.S.C. Section 9621[e]).

To-be-considered (TBC) information consists of nonpromulgated advisories or guidance issued by federal or state governments that are not binding legally and do not have the status of ARARs. As appropriate, TBC information should be considered in determining the removal action necessary for protection of human health and the environment. Requirements drawn from TBC information may be included in the selected alternative.

Because the alternatives would result primarily in waste generation and potential releases to the environment, the key ARARs identified for the alternatives considered include waste management standards, standards controlling releases to the environment, standards for protection of natural resources, and safety and health standards[1]. The ARARs are discussed generally in the following sections.

The ARARs for this removal action were identified in the action memorandum for the 100-N Area ancillary facilities (Ecology 1999). These ARARs include waste management standards; standards controlling releases to the environment; cleanup standards; and standards for the protection of cultural, historical, and ecological resources. A discussion of how the removal action will comply with these ARARs is provided in the following subsections.

4.2 WASTE MANAGEMENT PLAN

Waste management activities performed in this RAWP shall be in accordance with the waste management ARARs identified in the action memorandums for the 100-N Area facilities

[1] Safety standards are not environmental standards per se and therefore not potential ARARs. Instead, compliance with applicable safety regulations, (e.g., OSHA requirements) is required external to the CERCLA ARAR process. However, due to the nature and importance of these standards, a discussion of the safety requirements is included in this work plan.

(Ecology 1999, 2005a). Waste management activities will be performed in accordance with the following ARARs:

- The *Toxic Substances Control Act of 1976* (TSCA), as implemented by 40 CFR 761 and WAC 173-303-071(3)(k) with regards to management of PCB waste
- RCRA, as implemented by 40 CFR 260-268 and WAC 173-303 with regards to management of dangerous waste
- The *Hazardous Material Transportation Act of 1974* (49 U.S.C. 1801 to 1813), as implemented by 49 CFR 100-179 with regards to offsite transportation of hazardous materials
- The *Clean Air Act of 1955*, as implemented by "National Emissions Standards for Hazardous Air Pollutants" (40 CFR 61, Subpart M) with regards to the removal of asbestos and ACM.

The requirements specified by the ARARS, this waste management plan, and other applicable guidance will be addressed in the contractor's procedures or work control documents. The work control documents will address designation, waste minimization, packaging, handling, marking and labeling, storage, transportation, and treatment as they specifically apply to waste streams associated with the 100-N Area ISS facilities. Wastes will be generated from both S&M activities conducted prior to D4 and ISS as well as from D4 and ISS activities. The expected waste streams include, but are not limited to, the following:

- Solid waste (nonradioactive, nondangerous waste)
- Low-level radioactive waste
- Hazardous and dangerous wastes
- Mixed waste (waste that is both low-level radioactive waste and hazardous waste)
- Asbestos waste
- PCB wastes
- Transuranic waste
- Refrigerants (ozone-depleting substances).

4.2.1 Waste Characterization and Designation

The waste characterization requirements were developed as part of a data quality objective process. Waste generated will be characterized in accordance with the contractor's procedures, the requirements of the receiving facility, the *100-N Area Ancillary Facilities Waste Characterization Sampling and Analysis Plan* (DOE-RL 2007), and the *Sampling and Analysis Plan for the 105-N/109-N Interim Safe Storage Waste Characterization* (DOE-RL 2006c). Characterization will be conducted through process knowledge, sampling/analysis, and radiological surveys.

A team of select personnel will inspect the portions of the facilities as the removal action/maintenance occurs. The inspection will identify suspect chemical/hazardous and radiological materials in order to identify the waste streams for project planning.

Radiological surveys will be performed using hand-held and/or large area detection equipment that may be augmented with data logging equipment for recordkeeping during surveys. Additional advanced characterization equipment (e.g., AIL GammaCam™ M31 gamma-ray/video imaging system for locating hot spots, or a Canberra In Situ Object Counting System gamma-ray spectrometric system) may be deployed for the rapid, economical, and accurate characterization of materials for radiological contamination.

The data generated as part of waste characterization will be used to develop the following information (as applicable):

- Contaminant identification
- Contaminant concentrations
- Waste treatment requirements
- Waste packaging and disposal requirements
- Worker health and safety conditions
- Decontamination requirements
- Operational precautions
- Waste acceptance documents
- Transportation documents.

Additional characterization may be required based on disposal facility acceptance criteria.

4.2.2 Waste Minimization

Waste minimization practices will be followed to the extent technically and economically feasible during all phases of waste management. Waste materials will be recycled, reused, or reclaimed when feasible. To be suitable for recycling or reuse, the materials in question must (1) be needed or in demand, (2) be able to meet the DOE and Hanford Site free release criteria, and (3) not result in an excessive cost to the government. The decision of whether the materials meet the criteria will be made by contractor management with input from technical personnel.

Introduction of clean materials into a contamination area and contamination of clean materials will be minimized to the extent practicable. During all phases of waste management, emphasis will be placed on source reduction to eliminate or minimize the volume of wastes that will be generated.

All materials released offsite for disposal/recycle must be certified free of radiological contamination in accordance with the contractor's material release procedures. Waste materials with no or de minimis levels of 100-N Area CERCLA hazardous substances are not considered CERCLA waste and are therefore not subject to the 40 CFR 300.440 offsite acceptability determination.

™ GammaCam is a trademark of AIL Systems, Inc., Deer Park, New York.

4.2.3 Waste Handling, Storage, and Packaging

CERCLA Section 104(d)(4) states that where two or more noncontiguous facilities are reasonably related on the basis of geography or on the basis of the threat or potential threat to the public health or welfare or the environment, these facilities may be treated as one for the purposes of this section. The preamble to the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR 300) clarifies the stated EPA interpretation that when noncontiguous facilities are reasonably close to one another and wastes at these sites are compatible for a selected treatment or disposal approach, CERCLA Section 104(d)(4) allows the lead agency to treat these related facilities as one site for response purposes and, therefore, allows the lead agency to manage waste transferred between such noncontiguous facilities without obtaining a permit.

For CERCLA wastes that are transferred to a facility not considered "onsite," 40 CFR 300.440 requires an offsite acceptability determination from the EPA for the receiving facility. With respect to this removal action, EPA has issued determinations[1] for the following locations/waste streams:

- The ERDF is considered "onsite" for management/disposal of waste from removal actions addressed in the action memorandum (Ecology 1999)
- The CWC, in accordance with the approved offsite acceptability determination (EPA 2002) for transuranic and mixed waste (including radioactive PCB waste) that cannot be sent to ERDF
- Perma-Fix, in accordance with the approved offsite acceptability determination (EPA 2006) for waste requiring treatment
- The ETF, in accordance with this RAWP, is approved to store and treat liquid waste generated from this removal action, provided the facility waste acceptance criteria are met.

In addition to these previously established determinations, a noncontiguous onsite approval is appropriate for the Radiological Counting Facility (RCF) in the 300 Area to receive and analyze CERCLA samples associated with 100 Area and 300 Area CERCLA actions and ERDF. Activities in the RCF (composed of MO-265 and MO-423) involve the preparation and counting of radiological samples (e.g., soil, smears) from Hanford Site CERCLA projects. This facility receives and processes only samples associated with Hanford Site CERCLA response actions. Air discharge standards associated with operation of the RCF are presented in the Air Monitoring Section (Appendix B). Approval of this RAWP constitutes EPA and Ecology approval for the RCF as a noncontiguous onsite facility under CERCLA Section 104(d)(4) for receipt and processing of samples associated with Hanford Site CERCLA actions in the 100 Area and ERDF.

[1] EPA will notify DOE in writing of any change in the offsite determination of these listed facilities.

4.2.3.1 Area of Contamination. The AOC for this removal action is located within the AOC for the 100-N ancillary facilities as defined in Figure 1-2. No further delineation between work scope boundaries is necessary.

The AOC boundaries have been established to:

- Address areas of known, suspected, and potential chemical and radiological contamination in the ancillary facilities, underground pipelines connecting the facilities, and associated soils
- Exclude noncontaminated areas, soils, and structures
- Include the ancillary facilities intended for demolition.

Any waste management locations outside of the AOC and within the onsite area must meet the substantive requirements of all ARARs. For waste management inside the AOC, safe and effective management practices shall be established to ensure protection of human health and the environment. Substantive provisions of waste management ARARs may be used, when appropriate, within the AOC in this regard. Standards for managing waste within and outside the AOC shall be documented in the contractor's work control documents.

Staging Piles. As an alternative to storage within the AOC, waste that is not immediately transported to ERDF or other lead regulator-approved disposal facility may be stored in staging piles. Staging piles used for the onsite management of RCRA hazardous or dangerous waste must be operated in accordance with the standards and design criteria prescribed in 40 CFR 264.554, paragraphs (d) through (k). General requirements for staging piles include the following:

- Staging piles are to be used only as part of this removal action for temporary storage at a facility and must be located within the contiguous property where the waste to be managed in the staging piles is oriented.
- Surveys of the staging pile area will be performed prior to placement to ensure that no cross-media transfer or staging of waste on previous contaminated areas.
- The staging pile must be designed to prevent or minimize releases of hazardous wastes and hazardous constituents into the environment and minimize or adequately control cross-media transfer. To protect human health and the environment, this includes installation of 15-cm (6-in.) berms, dust control practices, or using plastic liners or covers, as appropriate.
- The staging pile must not operate more than 2 years (measured from the first time remediation waste is placed in the pile), except when the lead agency grants an operating term extension. A record of the date when remediation waste was first placed in the staging pile must be maintained until final closeout of the site is achieved.

- Ignitable or reactive waste must not be placed in a staging pile unless it has been treated or mixed before being placed in the pile so that the waste no longer meets the definition of ignitable or reactive waste, or the waste is managed in order to protect it from exposure to any material or condition that may cause it to ignite or become reactive.

- Incompatible wastes may not be placed in the same staging pile, unless the requirements in 40 CFR 264.17(b) have been met. The incompatible materials must be separated or they must be protected from each other with a dike, berm, wall, or other device. Remediation waste may not be piled on the same base where incompatible wastes or materials were previously piled, unless the base has been decontaminated sufficiently to comply with 40 CFR 264.17(b).

Approval of this RAWP by the lead regulator constitutes general authorization to operate staging piles during the execution of this removal action. Specific staging pile locations will be identified in project drawings and approved by the lead regulator in the Unit Manager Meeting minutes. Field operation of staging piles within the referenced regulatory provisions will be accomplished compliant with the requirements described above.

Once the materials have been removed, to close out the staging pile, samples of the residual soil will be collected in accordance with the *100-N Area Sampling and Analysis Plan for CERCLA Waste Sites* (100-N Area SAP) (DOE-RL 2006a). In cases where staging piles for industrial waste sites are located in an uncontaminated area, the sample results should be compared against the soil cleanup levels identified in the 100-N Area SAP. If the sample results exceed the cleanup levels, the area shall be further remediated or deferred to the 100-NR-1 work following lead regulator concurrence.

4.2.3.2 Common Waste Handling, Storage, and Packaging Requirements. The requirements in the following paragraphs are common to both inside and the outside the AOC.

Nonbulk containers or packages of waste requiring tracking (e.g., hazardous, mixed) will be assigned a package identification number by a waste transportation specialist. Containers in poor condition will have the contents transferred to a container in good condition. Portable fire extinguishers and spill-control equipment will be available.

Bulk waste may be placed in bulk roll-off containers for ERDF disposal. The containers will be lined and covered. Lightweight material (e.g., paper and plastic) will be bagged, if appropriate, prior to placement in the container to eliminate the potential of the materials blowing out of the container.

All containers, packages, or items requiring storage in a radioactive materials area will be marked/labeled with radioactive material markings. Storage of all containers (except for containers used to collect fluorescent light tubes) will be closed and secured when not being filled or emptied. Containers will be appropriately labeled and/or marked in accordance with all applicable requirements. Containers will be stored to prevent the accumulation of water.

4.2.3.3 Specific Waste Handling, Storage, and Packaging Requirements. The following specific requirements apply outside of the AOC for the variety of wastes that may be encountered during S&M and the D4 and ISS removal actions.

Solid Waste. Nondangerous solid waste will be managed in accordance with WAC 173-350, with an emphasis on recycling. Management of dangerous waste under WAC 173-303 is addressed in the Hazardous/Dangerous Waste subsection. Recyclable wastes should be managed in accordance with the Management Plan for Recyclable Materials administered by the Hanford Site's CCRC. All materials released offsite for disposal, recycle, or salvage must be certified as free of radioactive contamination in accordance with the contractor's material release procedures. Additionally, materials containing CERCLA hazardous substances (unless present in de minimis concentrations) may only be released to an offsite facility that has received approval from EPA in accordance with 40 CFR 300.440.

Low-Level Radioactive Waste. Liquids will be collected in appropriate containers. Dependent upon volume and characteristics (e.g., pH, oils, waste codes), containers will vary from drums to bulk holding tanks.

Demolition debris will be sized in accordance with the waste acceptance criteria of the disposal facility. Radioactive solids will be placed in containers for ERDF disposal.

Hazardous/Dangerous Waste. Hazardous/dangerous waste managed outside of the AOC will be packaged and stored to prevent dispersion and public exposures as required by WAC 173-303. Waste-specific storage and packaging requirements will be described in the contractor's work control documents, as appropriate, to address WAC and U.S. Department of Transportation (DOT) requirements.

Mixed Waste. Mixed waste will be managed in compliance with the substantive requirements for both hazardous/dangerous wastes and radioactive waste.

Storage is allowed at the Hanford Site's CWC under the offsite acceptability determination issued by EPA (EPA 2002).

Asbestos. Multiple forms of asbestos are expected to be encountered. Removal and disposal of asbestos and ACM are regulated under the *Clean Air Act Amendments of 1977* (implemented via 40 CFR 61, Subpart M) and under health and safety regulations promulgated pursuant to the OSHA regulations (implemented via 29 CFR 1926.1101, 29 CFR 1910.1001, and WAC 296-62 Part I). The 40 CFR 61 requirements applicable to this removal action are contained in 40 CFR 61.145(c) and 40 CFR 61.150. These regulations establish removal requirements based on quantity present, and specify handling, packaging, and disposal requirements for regulated sources having the potential to emit asbestos. Asbestos work, air monitoring, and worker safety requirements will be performed in accordance with 40 CFR 61.145(c), 40 CFR 61.150, 29 CFR 1926.1101, and the contractor's procedures for ACM removal.

All friable and most nonfriable ACMs and presumed ACMs will be removed prior to demolition of the area. Asbestos removal will be performed by trained asbestos certified workers, and oversight will be provided by a competent person trained in asbestos regulations. This person must be on site at all times that work is being performed on ACMs. ACM typically consists of insulation for piping, floor tiles, and cement asbestos board. Insulation on piping and surfacing materials (e.g., sprayed on fire stop) will be removed as Class I asbestos work, and nearly all other ACM in the facilities will be removed as Class II (e.g., floor tiles and cement asbestos board). There could be instances where friable asbestos is to be left in place during demolition because the facility is structurally unsound and in danger of imminent collapse. In these cases only the requirements of 40 CFR 61.145(c)(4) through (c)(9) would apply, in accordance with 40 CFR 61.145(a)(3). The substantive requirements of the *Clean Air Act Amendments of 1977* standards are applicable to the abatement of asbestos and ACMs. Both the substantive and administrative requirements of the OSHA standards are applicable to the removal of asbestos and ACM. Asbestos removal and waste management practices will be further addressed in work-specific documents.

Ozone-Depleting Substances. 40 CFR 82, Subpart F establishes requirements for the recovery, recycling, and reclamation of ozone-depleting substances from refrigeration equipment that may be present within facilities addressed by this removal action. The substantive requirements of Subpart F will apply to actions being taken within the onsite area. The substantive and administrative requirements are applicable when performing recovery, recycling, reclamation, or disposal actions at offsite facilities. Wastes containing CERCLA hazardous substances (unless present in de minimis concentrations) may only be released to an offsite facility that has received approval from EPA in accordance with 40 CFR 300.440.

PCBs. PCBs are identified as potential contaminants in the 105-N/109-N ISS facilities and the 100-N Area ancillary facilities, and PCB-contaminated waste will likely be generated. The various waste matrixes that may contain PCBs include PCB oils, PCB remediation waste, and PCB-contaminated items.

The PCB bulk product waste or remediation waste will be managed within the AOC, or a centralized area within the CERCLA onsite area (following approval of a centralized area by Ecology). Outside the AOC, containers will be marked with a ML marking (CAUTION – CONTAINS PCBs) as required by the TSCA.

Areas outside the AOC containing packaged PCBs will be marked with signs posting "DANGER-UNAUTHORIZED PERSONNEL KEEP OUT" at each entrance. The ML marking will also be posted in accordance with 40 CFR 761.

Staging of PCB waste at the 100-N Area ancillary facilities must be done in a manner that satisfies substantive provisions of 40 CFR 761.65(b). The use of an "overpack" container is acceptable for outside storage. Although the "overpack" containers may not represent the typical concept of a "facility," they satisfy the substantive requirements for roof, walls, nonporous floors, and spill protection.

Transuranic Waste. If encountered, transuranic waste will be managed in accordance with the contractor's procedure. The CWC, T Plant, or the Waste Receiving and Processing Facility will be used for interim storage of any transuranic waste encountered. Storage is allowed at the

Hanford Site's CWC under the offsite acceptability determination issued by EPA (EPA 2002). An offsite acceptability determination from EPA will be required under 40 CFR 300.440 prior to sending any waste to the T Plant or Waste Receiving and Processing Facility.

Liquid Waste. All liquid waste treated or disposed of at a location other than ERDF must first be approved by EPA. Possible disposal locations include the ETF or a facility outside of the Hanford Site. This does not include liquid waste that is free or contains de minimis levels of CERCLA hazardous substances.

All requests to use water for dust suppression will require prior Ecology approval.

4.2.4 Waste Treatment

Treatment of waste streams may be necessary to provide for safe transport or storage. Treatment may also be required prior to disposal or to meet the appropriate waste acceptance criteria. The type of treatment for RCRA hazardous or dangerous waste and the location of treatment will be approved by DOE and the lead regulatory agency on a case-by-case basis in accordance with the substantive requirements of RCRA and WAC 173-303 or other appropriate treatment regulations. Upon lead regulatory agency approval, solidification, encapsulation, neutralization, and size reduction/compaction may be employed to treat various wastes. For wastes requiring treatment, the techniques will be documented in a treatment plan approved by the lead regulatory agency.

Several mixed waste streams have already been reviewed and approved for treatment and disposal at ERDF. These mixed waste streams are as follows:

- Radioactively contaminated elemental mercury may be amalgamated.
- Radioactively contaminated elemental lead or hazardous/dangerous waste debris (with Ecology approval) may be macroencapsulated at ERDF.
- Radioactively contaminated lead-acid, cadmium, silver, and mercury-containing batteries may be macroencaptulated at ERDF. Liquids in lead-acid batteries will be drained and treated, as necessary, prior to disposal.
- Aqueous solutions may be treated in accordance with the approved waste treatment plan and sent to ERDF.

Stabilization of soils contaminated with lead or other heavy metals may be treated by stabilization at ERDF, provided the soils meet the ERDF waste acceptance criteria and provided Ecology approves of the treatment plan.

The above-listed waste streams will be treated as they are encountered, and the contractor will notify the DOE and regulatory agencies via e-mail. If waste is encountered for which there is no available treatment, the DOE will meet with the regulatory agencies to determine the appropriate action for the waste stream.

4.2.5 Waste Transportation and Shipping

All shipments will be made in accordance with U.S. Department of Transportation regulations, 49 CFR 171-179, 10 CFR 830, applicable sections of WAC 173-303, and/or the contractor's waste transportation procedures as applicable.

The removal action is expected to require offsite transportation of wastes and potentially contaminated samples. The offsite handling and shipping of wastes and potentially contaminated samples will be in accordance with the *Hazardous Materials Transportation Act of 1974*, as implemented through 49 CFR 100 through 179.

4.2.6 Disposal

All waste resulting from this action will be evaluated to determine if the waste meets ERDF waste acceptance criteria for disposal. CERCLA waste disposed of at any disposal facility other than ERDF requires EPA approval in accordance with 40 CFR 300.440. Any PCB waste that does not meet ERDF waste acceptance criteria (WCH 2008a) may be transported for treatment and/or disposal to a TSCA offsite disposal facility following the receipt of an acceptability determination by the EPA pursuant to 40 CFR 300.440.

Solid waste may be sent for offsite disposal at a municipal/industrial landfill. Disposal of materials containing no or de minimis levels of CERCLA hazardous substances would not require an offsite acceptability determination per 40 CFR 300.440.

The *Hanford Site Solid Waste Acceptance Criteria* (FH 2006) identifies criteria for acceptance of waste at the CWC. The *Liquid Waste Processing Facilities Waste Acceptance Criteria* (FH 2005) identifies criteria for acceptance of waste at the ETF. The *Environmental Restoration Disposal Facility Waste Acceptance Criteria* (WCH 2008a) and the ERDF supplemental waste acceptance criteria (WCH 2008b) provide the waste acceptance criteria for ERDF.

4.2.7 Recycling

Some of the waste from the D4 and ISS activities of the 100-N Area ISS facilities may contain materials that could be beneficially recycled. As applicable, these materials would be managed/recycled in accordance with the contractor excess procedures or the CCRC management plan. Recycling of materials from D4 and ISS activities that contain CERCLA hazardous substances will require an offsite acceptability determination from EPA in accordance with 40 CFR 300.440.

Recycling of materials (e.g., noncontaminated wood, steel, masonry brick) containing no or de minimis levels of CERCLA hazardous substances would not require an offsite acceptability determination per 40 CFR 300.440. Recycling of items generated as a result of routine operational or maintenance activities (e.g., replacement of burned-out light bulbs or discharged batteries from functioning equipment) would also not require an offsite acceptability determination. Additionally, recycling of materials (e.g., aerosol cans, batteries, used oil) generated at facilities supporting CERCLA activities would also not require an offsite acceptability determination.

4.3 STANDARDS CONTROLLING RELEASES TO THE ENVIRONMENT

4.3.1 Standards Controlling Air Emissions to the Environment

The proposed removal action alternatives would have the potential to generate both radioactive and nonradioactive airborne emissions. WAC 246-247 has been identified as being applicable to the release of airborne radionuclides during the removal action. In addition, WAC 173-400 and WAC 173-460 have been identified as being applicable to the release of toxic air pollutants that may occur during the removal action. The substantive portions of these requirements that are to be implemented during the removal action are discussed below.

Radioactive air emissions are to be controlled through the use of best available radionuclide control technology (WAC 246-247-040[3]) for new construction or significant modifications or as low as reasonably achievable control technology (WAC 246-247-040[4]) for existing emission units or nonsignificant modifications. Emissions of radionuclides are to be measured for point sources (WAC 246-247-075[3]) and for nonpoint sources (WAC 246-247-075[8]). Measurement techniques may include, but are not limited to, sampling, calculation, smears, or other reasonable method for identifying emissions as determined by Ecology. The substantive requirements of these regulations are applicable because fugitive, diffuse, and point source emissions of radionuclides to the ambient air may result from activities performed during the removal action. Appendix B describes how the substantive portions of these requirements are to be implemented for this removal action.

WAC 173-400 and 173-460 establish requirements for emissions of criteria/toxic air pollutants. The primary source of emissions resulting from this removal action would be fugitive particulate matter. Requirements applicable to this removal action are contained in WAC 173-400-040(3) and (8). These regulations require that reasonable precautions be taken to (1) prevent the release of air contaminants associated with fugitive emissions resulting from materials handling, demolition, or other operations, and (2) prevent fugitive dust from becoming airborne from fugitive sources of emissions.

WAC 173-460 may be applicable to removal actions that require the use of a treatment technology that emits toxic air pollutants. No treatment requirements have been identified at this time that would be required to meet the substantive applicable requirements of WAC 173-460. Treatment of some waste encountered during the removal action may be required to meet ERDF waste acceptance criteria. In most cases, the type of treatment anticipated would consist of solidification/stabilization techniques such as macroencapsulation or grouting, and WAC 173-460 would not be considered an ARAR. If more aggressive treatment is required that would result in the emission of toxic air pollutants, the substantive requirements of WAC 173-460-030, WAC 173-460-060, and WAC 173-460-070 would be evaluated to determine if the requirements are applicable.

Emissions to the air will be minimized during D4 activities through the use of standard industry practices such as the application of water sprays and fixatives, temporary confinement enclosures/glovebag containments that may be HEPA filtered, and HEPA-filtered and/or charcoal-filtered vacuums. These techniques are considered to be reasonable precautions to control fugitive emissions as required by the regulatory standards and are the same techniques as those applied to control radionuclide air emissions.

Appendix B of this document provides additional information pertaining to the release and control of potential radiological contaminants to the air and is applicable only to emissions of radiological materials to the air.

4.3.2 Stormwater Runoff

Stormwater runoff from some of the facilities listed in the action memorandums (Ecology 1999, 2005a) discharge to engineered structures (e.g., injection wells). These injection wells are registered pursuant to WAC 173-218. *State Waste Discharge Permit ST 4511* (Ecology 2005b) issued pursuant to WAC 173-216 addresses discharges of stormwater to engineered structures. Substantive provisions of the permit include the implementation of BMPs, which are intended to prevent or reduce the spread of contamination and pollution of groundwater of the state, and meeting the groundwater quality criteria. The substantive requirement of WAC 173-218 are applicable to the decommissioning of underground injection control wells that do not require further remediation under the 100-NR-1 or 100-NR-2 Operating Unit. Sampling and analysis of the stormwater discharge is not normally required as long as the proper pollution prevention and BMPs are followed, unless contamination exists. Stormwater that has become contaminated is to be sampled to verify that the groundwater quality criteria are met prior to discharge to the injection well.

The BMPs identified in *State Waste Discharge Permit ST 4511* (Ecology 2005b) and the *Pollution Prevention and Best Management Practices Plan for State Waste Discharge Permit ST4508, ST4509, and ST4510* (DOE-RL 2000) will be implemented as appropriate. These BMPs include actions such as conducting inspections to identify and remove materials that could contaminate stormwater discharges, implementing good housekeeping practices to segregate and store materials and wastes in a manner to prevent the potential for contaminating stormwater, taking reasonable efforts to minimizing ponding, collecting discharges that have become contaminated, cleaning up spilled materials and liquids promptly, and informing work crews of the appropriate BMPs to be implemented.

The removal actions specified in the action memorandums (Ecology 1999, 2005a) will result in a unique set of circumstances for each facility. Additional BMPs may be needed to prevent the discharge of contaminated stormwater runoff to an injection well. These practices could include berming, rerouting stormwater discharges, or creating new discharge locations. If an existing injection well must be closed, it will be evaluated for the presence of contamination and sampled as necessary. If the well does not require further action under CERCLA, it will be decommissioned in accordance with WAC 173-218. Where additional BMPs are required to prevent contamination of stormwater runoff to the injection wells, they will be documented in facility-specific work controlling documents (e.g., work packages). Lead regulatory agency concurrence will be obtained prior to creating a new discharge location.

The substantive requirements of "Minimum Standards for Construction and Maintenance of Wells" (WAC 173-160) are applicable when decommissioning groundwater wells that are found to require closure prior to performing D4 activities (i.e., the well is located within the building layback boundary).

There is also overland stormwater runoff from areas adjacent to some of the facilities. Some of this stormwater runoff has the potential to reach the bank of the Columbia River, or possibly the Columbia River, through drainage ditches, erosion areas, or other conveyances. These areas were at one time included in a stormwater pollution prevention plan written to address the requirements of a National Pollutant Discharge Elimination System general permit issued pursuant to 40 CFR 122. It was subsequently determined, based on an evaluation of these areas, that coverage was not required under the general permit for stormwater discharges associated with industrial activity. The potential to impact these areas during the removal action will be evaluated, and the potential for runoff from these areas will be eliminated or appropriate best management practices will be implemented. Controls will be implemented, as necessary, to ensure that the removal action does not result in the discharge of contaminated stormwater at any discharge points. Substantive control requirements from the General Permit for Storm Water Discharges from Construction Activities will be considered, as appropriate. Appropriate controls will be documented in work controlling documents.

4.4 CLEANUP STANDARDS

4.4.1 Final Characterization

The process for performing facility completion is described in Sections 2.1.10 and 2.1.11 of this document. Where the building foundation is above, or intersecting, significant underground contamination or active utilities, characterization information for the area will be generated to document the status of conditions at the conclusion of this project.

4.4.2 Release of Property

All property that is released for offsite disposal and/or reuse and recycle is nonreal property. The release of nonreal property will follow the guidance provided in the contractor's documents. Property released via this process shall contain no or de minimis levels of CERCLA hazardous substances and therefore will not be subject to CERCLA.

4.5 STANDARDS FOR THE PROTECTION OF CULTURAL, ECOLOGICAL, NATURAL, AND HISTORICAL RESOURCES

The *Archeological Resources Protection Act* (16 U.S.C. 470aa), as implemented via 43 CFR 7, provides for the preservation of historical and archeological data (including artifacts) that might be irreparably lost or destroyed as the result of a proposed action. Although the removal action will occur in previously disturbed areas and the discovery of artifacts is unlikely, this law would be applicable to any significant artifacts that may be discovered. The likelihood would be greater at borrow sites from which backfill material is obtained. Awareness training will be provided to site workers. If archeological materials are discovered, a mitigation plan will be developed in consultation with appropriate authorities.

The *Native American Graves Protection and Repatriation Act*, as implemented via 43 CFR 10, requires agencies to consult and notify culturally affiliated tribes when Native American human remains are inadvertently discovered during project activities. It is unlikely that work proposed in this removal action would inadvertently uncover human remains. If human remains were encountered, the procedures documented in the *Hanford Cultural Resources Management Plan* (DOE-RL 2003) would be followed.

The *National Historic Preservation Act of 1966* (16 U.S.C. 470), as implemented via 36 CFR 800), requires federal agencies to evaluate historic properties for National Register of Historic Places (36 CFR 800, Section 106) eligibility and to mitigate adverse effects of federal activities on any site eligible for listing in the Register. A programmatic agreement prepared by DOE (DOE-RL 1996) specifies how activities at the Hanford Site will identify, evaluate, and treat buildings and historic archaeological remains from the Hanford era. The accompanying treatment plan (DOE-RL 1998b) directs the process for evaluating properties on the Hanford Site and identifies several 300 Area buildings within the scope of this RAWP as contributing facilities recommended for individual documentation. Stipulation V(C) of the programmatic agreement requires that an interior assessment be undertaken for these facilities to identify artifacts that may have interpretative or education value prior to D4 activities. Historic items tagged during this walkdown will either be photographed or the items will be retrieved and transported to an appropriate duration facility as stipulated by DOE.

The *Endangered Species Act of 1973* (16 U.S.C. 153), as implemented via 50 CFR 402 and WAC 232-012-297, requires the conservation of critical habitat on which endangered or threatened species depend and prohibit activities that threaten the continued existence of listed species or destruction of critical habitat. The *Migratory Bird Treaty Act of 1918* makes it illegal to remove, capture, or kill any migratory bird or any part of nests or the eggs of any such birds. Although adverse impacts to endangered or threatened species or migratory birds are not expected, activity specific ecological reviews will be conducted to identify and mitigate any potentially adverse impacts prior to beginning field work.

5.0 PROJECT MANAGEMENT AND ORGANIZATION

5.1 PROJECT SCHEDULE AND COST ESTIMATE

This removal action will be scheduled and estimated using the contractor's hierarchy of schedules, which include activity logic and restraints. Activities will be resource loaded for both nonmanual and manual personnel. Equipment needs are identified and other materials are estimated and included in the budgeted cost of work scheduled.

The schedule, which encompasses the work scope of the 100-N Area ISS facilities' removal action (beginning in fiscal year 2005), is included in Appendix A. A more detailed schedule, including assumptions, resources, and activity breakdown, will be developed as part of the final planning efforts and will be used to manage the project on a day-to-day basis as noted below. The schedule included in this document is also subject to change to be compliant with the River Corridor Closure Project strategy and funding of continued work in the 100-N Area. The schedule in Appendix A will be updated as this RAWP is revised.

5.1.1 Project Cost and Schedule Tracking

Performance measurement and analysis is performed by the contractor. Project cost and schedule are controlled and updated using the contractor's Management Control System.

An earned-value system tracks the cost, schedule, and performance as the project progresses towards completion. Cost/schedule performance reports provide budgeted cost of work scheduled comparisons and budgeted costs of work performed against the actual cost of work performed. These reports provide variances to the baseline schedule and cost as budgeted in the project's detailed work plan. Variances above threshold values are documented, as well as the rationale for the variance(s) and any recovery plan required.

Trends and baseline change proposals are readily identified through the contractor's formal trend and change control program. All changes that affect the baseline are documented. The contractor's trend register, which is reviewed monthly by contractor senior management, categorizes trends from conception to final resolution. Trends are identified as either performance trends or scope trends and are further defined as resolved or unresolved.

Fiscal year project staffing, as budgeted, is reconciled monthly during project review meetings to the actual number of full-time-equivalent personnel used during the month. Likewise, the corresponding number of hours actually worked are presented and compared to the budgeted current work plan. Actual overtime is monitored monthly (by department) and is reconciled to the current budgeted overtime.

Cost and schedule variances to the current budget are tracked both on a monthly and to-date basis and are reconciled back to the cause of the variance. Project impacts due to the cost and/or schedule variance are described and corrective actions are identified and tracked to the point of final resolution.

5.2 CONDUCT OF OPERATIONS

Conduct of operations is imposed to ensure that work is performed in a controlled and organized manner, such that all facets of work activities have been considered, and that necessary documentation is maintained. Line organizations review existing and planned programs important to safe and reliable facility operations and assess the effectiveness of corporate directives, plans, or procedures at facilities under their cognizance.

Conduct of operations strongly emphasizes technical competency, workplace discipline, and personal accountability to ensure the achievement of a high level of performance during all activities. Safety is the first priority, and all planning will include appropriate safety analyses to identify potential safety and health risks and the means to appropriately mitigate these risks. Workers will not start work until approved safety procedures, instructions, and directions implementing ISMS are provided.

Conduct of operations requires workers to be alert and aware of conditions affecting the job site. Operators and workers conducting field activities should be notified of changes in the building and/or work area status, abnormalities, and difficulties encountered in performing project operations. Similarly, operators and workers will notify the chain of command of any unexpected situations. In accordance with the severity of a finding (e.g., emergency condition), notification requirements will be expanded to include upper tier management and regulatory agencies.

5.3 CHANGE MANAGEMENT/CONFIGURATION CONTROL

If a change arises that results in a fundamental change to the selected response action that is not within the scope of work, another EE/CA or proposed plan and supporting documentation will be prepared to allow DOE and the lead regulatory agency to select a revised response action.

Established configuration/change control processes ensure that proposed changes are reviewed in relation to the specified commitments. If a breach of these commitments is discovered, work ceases so stabilization and/or recovery actions may be identified and implemented as appropriate. Change management will comply with the appropriate contractor's procedure.

Change management for facilities that have a hazard categorization of Nuclear-Less than Category 3 will comply with the contractor's procedure for management of change process. Change management for facilities that have a hazard categorization of Nuclear-Category 3 will comply with the contractor's procedure for unreviewed safety question process.

5.4 PERSONNEL TRAINING AND QUALIFICATIONS

During the performance of project activities, the experience and capabilities of the operating staff are extremely important in maintaining worker and environmental safety. Day-to-day knowledge of ongoing operations, month-to-month understanding of conditions encountered, and lessons learned will be imperative to continued safe operations.

Training requirements will ensure that personnel have been instructed in the technologies to work safely in and around radiological areas and to maintain their individual radiation exposure and the radiation exposures of others ALARA. Standardized core courses and training material will be presented, and site-specific information and technologies will be added to adequately train workers.

Health physics workers are required to have completed and be current in radiological control technician qualification training. These training courses require the successful completion of examinations to demonstrate understanding of theoretical and classroom material.

Specialized training will be provided as needed to instruct workers in the use of nonstandard equipment, in the performance of abnormal operations, and in the hazards of specific activities. Specialized training may be provided by on-the-job training activities, classroom instruction and testing, or pre-job briefings. The depth of training in any discipline will be commensurate with the degree of the hazard(s) involved and the knowledge required for task performance.

Some activities will require the acquisition of expert services as opposed to project staff training. Assaying of waste packages and dismantling the facility by specialized methods (e.g., diamond wire sawing) are examples of activities requiring expert assistance.

The contractor training program provides workers with the knowledge and skills necessary to safely execute assigned duties. A graded approach is used to ensure that workers receive a level of training commensurate with their responsibility that complies with applicable requirements. Specialized employee training includes pre-job safety briefings, plan-of-the-day meetings, and facility/work site orientations. The following training and qualifications may be applicable as required by job assignment for work activities:

- Training in accordance with 29 CFR 1910.120
  - 40-Hour Hazardous Waste Worker/8-Hour Refresher
  - 24-Hour Experience Component
  - 8-Hour Supervisor Training (for selected individuals)
  - HASP and RWP
  - Respirator Training
  - First Aid (two qualified persons per shift/crew)
  - Certified Asbestos Worker and/or Asbestos Awareness
  - Lead Worker
  - Radiation Worker
- Training in accordance with 49 CFR 172 Subpart H, "Training"
- Hazardous material training

- Medical surveillance requirements
  - Hazardous waste worker physical
  - Mask fit
  - Lead worker baseline
  - Asbestos worker.
- Dosimetry and bioassay requirements
  - Thermoluminescent dosimeter (as directed in the applicable RWP)
  - Plutonium bioassay (as determined by the Radiological Controls organization)
  - Whole body count.

The HASP, RWP, and hazards analysis will include specific requirements for project activities being conducted, which include PPE and required training for project personnel. This is discussed in detail in Section 3.5.

5.5 QUALITY ASSURANCE REQUIREMENTS

Overall quality assurance for the RAWP will be planned and implemented in accordance with 10 CFR 830.120, and other applicable standards. The quality assurance activities will be graded based on the potential impact on the environment, safety, health, reliability, and continuity of operations. Specific activities include quality assurance implementation, responsibilities and authority, document control, quality assurance records, and audits.

5.5.1 Quality Assurance Implementation

All project related activities will establish and implement appropriate quality assurance requirements. Conditions adverse to quality will be identified in nonconformance reports, audit reports, surveillance reports, and/or corrective action requests. Investigation and corrective actions in response to these adverse conditions will be completed in a timely manner.

5.5.2 Responsibilities and Authority

The contractor(s) must perform quality engineering, design reviews, surveillance, and audits (as necessary) to achieve quality assurance objectives. The contractor(s) must also ensure that the various subcontractors and design agencies establish design and quality assurance programs to control design in accordance with applicable requirements.

5.5.3 Document Control

All technical documents (e.g., specifications and drawings) will be controlled in accordance with approved configuration management procedures. The responsible design agency will maintain control of the design documents through acceptance of the documents. A project records checklist will be initiated to identify those records required for the final project file.

5.5.4 Quality Assurance Records

Each organization that maintains quality assurance records will be required to control the records in accordance with applicable contractor quality assurance requirements.

5.5.5 Audits/Assessments

Internal and external audits are to be performed by the contractor's Quality Assurance and Services organization to ensure project compliance with the quality assurance program requirements.

5.5.6 Self-Assessments

Self-assessments will be conducted by project personnel to determine compliance in accordance with the requirements of the contractor's procedure.

5.6 PROJECT CLOSEOUT

At the completion of all removal action activities, any documentation that addresses remaining facility conditions that has not already been recorded will be forwarded to the records retention center where it will be stored with records from the 100 Area facilities. Updates to WIDS will be performed, as necessary, and end state condition of facilities at the time of project closeout will be provided to Ecology.

At the completion of the ISS, the portions of 105-N/109-N within the SSE will then be turned over to a surveillance program where it will be managed for approximately 64 years. Additional information on activities conducted post-ISS will be contained within the S&M plan. The current practice is to install a monitoring system(s) to reduce the amount of entries needed by personnel. The monitoring systems allow for the measurement and tracking of any changes in temperature and the presence of water.

6.0 REFERENCES

10 CFR 830, "Nuclear Safety Management," *Code of Federal Regulations*, as amended.

10 CFR 835, "Occupational Radiation Protection," *Code of Federal Regulations*, as amended.

29 CFR 1910, "Occupational Safety and Health Standards," *Code of Federal Regulations*, as amended.

29 CFR 1926, "Safety and Health Regulations for Construction," *Code of Federal Regulations*, as amended.

36 CFR 800, "Protection of Historic and Cultural Properties," *Code of Federal Regulations*, as amended.

40 CFR 7, "Protection of Archaeological Resources," *Code of Federal Regulations*, as amended.

40 CFR 61, "National Emission Standards for Hazardous Air Pollutants," *Code of Federal Regulations,* as amended.

40 CFR 82, "Protection of Stratospheric Ozone," *Code of Federal Regulations,* as amended.

40 CFR 122, "The National Pollutant Discharge Elimination System," *Code of Federal Regulations*, as amended.

40 CFR 260, "Hazardous Waste Management System: General," *Code of Federal Regulations*, as amended.

40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*, as amended.

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*, as amended.

40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions," *Code of Federal Regulations*, as amended.

40 CFR 763, "Asbestos," *Code of Federal Regulations*, as amended.

43 CFR 7, "Protection of Archaeological Resources," *Code of Federal Regulations*, as amended.

43 CFR 10, "Native American Graves Protection and Repatriation Regulations," *Code of Federal Regulations*, as amended.

49 CFR 100-179, "U.S. Department of Transportation Requirements for the Transportation of Hazardous Materials," *Code of Federal Regulations*, as amended.

50 CFR 402, "Interagency Cooperation – Endangered Species Act of 1973," *Code of Federal Regulations*, as amended.

Archeological and Historic Preservation Act of 1974, 16 U.S.C. 469-469c.

Archeological Resources Protection Act, 16 U.S.C. 470aa.

Asbestos Hazard Emergency Response Act of 1986, 15 U.S.C. 2651, et seq.

BHI, 1995, *N Reactor Deactivation Program Plan*, BHI-00075, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 1997a, *105-NE Fission Products Trap and 1305-N Piping Preliminary Hazard Classification*, BHI-01110, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 1997b, *Preliminary Hazard Classification for the 105-N Building Non-Zone 1 Segment*, CCN 042888, interoffice memorandum from R. S. Day to M. E. Greenidge, dated March 26, 1997, Bechtel Hanford, Inc., Richland, Washington.

BHI, 1998a, *Auditable Safety Analysis and Final Hazard Classification for the 105-N Reactor Zone and 109-N Steam Generator Zone Facility*, BHI-01179, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 1998b, *Final Hazard Classification and Auditable Safety Analysis for the N Basin Segment*, BHI-00968, Rev. 1, Bechtel Hanford, Inc., Richland, Washington.

BHI, 1998c, *N Area Final Project Program Plan*, BHI-01130, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2001, *100-N Ancillary Facilities Preliminary Hazard Classification*, CCN 095435, interoffice memorandum from R. G. Egge to J. J. McGuire, dated December 18, 2001, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2003, *Data Quality Objective Summary Report for D&D Waste Characterization of the 100-N Ancillary Facilities and 190-DR Building*, BHI-01685, Rev. 0, Bechtel Hanford, Inc., Richland, Washington

Clean Air Act Amendments of 1977, Public Law 95-95, 301(b), 91 Stat. 685, 770.

Clean Air Act of 1955, 42 U.S.C. 7401, et seq.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. 9601, et seq.

DOE, 1992, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, DOE-STD-1027-92, Change Notice No. 1, U.S. Department of Energy, Washington, D.C.

DOE-RL, 1996, *Programmatic Agreement Among the U.S. Department of Energy Richland Operations Office, the Advisory Council on Historic Preservation, and the Washington State Historic Preservation Office for the Maintenance, Deactivation, Alteration, and Demolition of the Built Environment on the Hanford Site, Washington*, DOE/RL-96-77, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1997, *N Reactor Comprehensive Treatment Report, Hanford Site, Washington,* DOE/RL-96-91, Draft A, 3 vols., U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1998a, *Engineering Evaluation/Cost Analysis 100-N Area Ancillary Facilities and Integration Plan*, DOE/RL-97-22, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1998b, *Tri-Party Agreement Handbook Management Procedures*, RL-TPA-90-001, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2000, *Pollution Prevention and Best Management Practices Plan for State Waste Discharge Permits ST 4508, ST 4509, and ST 4510*, DOE/RL-67-97, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2002, *Hanford Emergency Management Plan*, DOE/RL-94-02, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2003a, *Hanford Cultural Resources Management Plan*, DOE/RL-98-10, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2004, *Engineering Evaluation/Cost Analysis for the 105-N Reactor Facility and 109-N Heat Exchanger Building*, DOE/RL-2004-46, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2005, *Remedial Design Report/Remedial Action Work Plan for the 100 Area,* DOE/RL-96-17, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2006a, *100-N Area Sampling and Analysis Plan for CERCLA Waste Sites*, DOE/RL-2005-92, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2006b, *Removal Action Work Plan for the 100-N Area Ancillary Facilities*, DOE/RL-2002-70, Rev. 2, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2006c, *Sampling and Analysis Plan for the 105-N/109-N Interim Safe Storage Waste Characterization*, Rev.0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2007, *100-N Ancillary Facilities Waste Characterization Sampling and Analysis Plan*, DOE/RL-2003-33, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, 1999, *Action Memorandum for the 100-N Area Ancillary Facilities*, LTR 064829, from M. A. Wilson to L. Piper, U.S. Department of Energy, Richland Operations Office, dated January 6, 1999, Washington State Department of Ecology, Olympia, Washington.

Ecology, 2005a, *105-N Reactor Building and 109-N Heat-Exchanger Building Action Memorandum*, LTR 0500979, from Michael A. Wilson to Keith A. Klein, U.S. Department of Energy, Richland Operations Office, dated February 22, 2005, Washington State Department of Ecology, Olympia, Washington.

Ecology, 2005b, *State Waste Discharge Permit Number ST 4511*, Washington State Department of Ecology, Olympia, Washington.

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order,* as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

Endangered Species Act of 1973, 16 U.S.C. 1531, et seq.

EPA, 1994, *Guidance for Data Quality Objectives Process*, EPA QA/G-4, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 2000, *Interim Remedial Action Record of Decision for the 100-NR-1 Operable Unit, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

EPA, 2002, *CERCLA Off-Site Acceptability Determination,* EPA ID #WA7 89000 8967, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

EPA, 2006, *CERCLA Off-Site Acceptability Determination*, CCN 128142 to J. W. Golden, Washington Closure Hanford, dated June 7, 2006, from A. L. Boyd, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

FH, 2005, *Liquid Waste Processing Facilities Waste Acceptance Criteria*, HNF-3172, Rev. 3, Fluor Hanford, Inc., Richland, Washington.

FH, 2006, *Hanford Site Solid Waste Acceptance Criteria*, HNF-EP-0063, Rev. 13, Fluor Hanford, Inc., Richland, Washington.

Hazardous Materials Transportation Act of 1974, 49 U.S.C. 1801-1813, et seq.

Migratory Bird Treaty Act of 1918, 16 U.S.C. 703, et seq.

National Historic Preservation Act of 1966, 16 U.S.C. 470, et seq.

Native American Graves Protection and Repatriation Act of 1990, 25 U.S.C. 3001, et seq.

Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, et seq.

Toxic Substances Control Act of 1976, 15 U.S.C. 2601, et seq.

WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," *Washington Administrative Code*, as amended.

WAC 173-216, "State Waste Discharge Permit Program," *Washington Administrative Code*, as amended.

WAC 173-218, "Underground Injection Control Program," *Washington Administrative Code*, as amended.

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

WAC 173-350, "Solid Waste Handling Standards," *Washington Administrative Code*, as amended.

WAC 173-400, "General Regulations for Air Pollution Sources," *Washington Administrative Code*, as amended.

WAC 173-460, "Controls for New Sources of Toxic Air Pollutants," *Washington Administrative Code*, as amended.

WAC 232-012-297, "Endangered, Threatened, and Sensitive Wildlife Species Classification," *Washington Administrative Code*, as amended.

WAC 246-247, "Radiation Protection -- Air Emissions," *Washington Administrative Code*, as amended.

WAC 296-62, "General Occupational Health Standards," *Washington Administrative Code*, as amended.

WCH, 2005a, *DQO Summary Report for 105-N/109-N Interim Safe Storage Project Waste Characterization*, WCH-15, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2005b, *Health and Safety Plan for 100 Area D4 Projects*, 0100N-SSHS-G0002, Rev. 4 or current revision, Washington Closure Hanford, Richland, Washington.

WCH, 2006, *Final Hazard Categorization and Auditable Safety Analysis for the 105-N/109-N Facility Interim Safe Storage Project*, Rev. 0, Washington Closure Hanford, Richland, Washington.

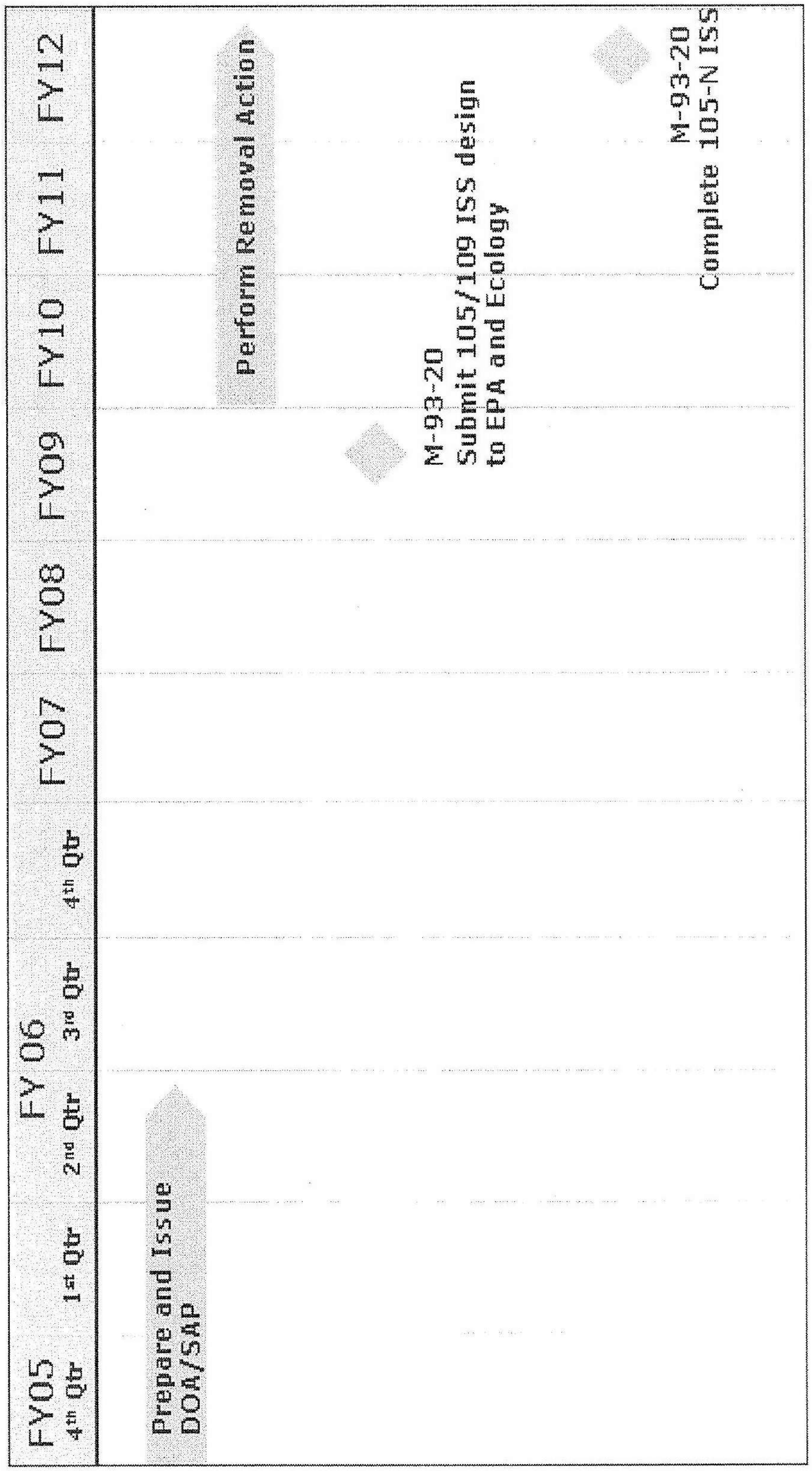
WCH, 2008a, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*, WCH-191, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2008b, *Supplemental Waste Acceptance Criteria for Bulk Shipments to the Environmental Restoration Disposal Facility*, 0000X-DC-W0001, Rev. 8, Washington Closure Hanford, Richland, Washington.

APPENDIX A

100-N AREA INTERIM SAFE STORAGE FACILITIES PROJECT SCHEDULE

Figure A-1. 100-N Area Interim Safe Storage Facilities Project Schedule.



APPENDIX B

AIR MONITORING PLAN FOR 105-N/109-N BUILDINGS INTERIM SAFE STORAGE

APPENDIX B

AIR MONITORING PLAN FOR 105-N/109-N BUILDINGS INTERIM SAFE STORAGE

1.0 INTRODUCTION

The placing of the 105-N/109-N Reactor Complex into a condition of interim safe storage (ISS) has the potential-to-emit (PTE) radionuclides. This activity is being conducted as part of a non-time-critical *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* removal action under an action memorandum (Ecology 2005) signed by the Washington State Department of Ecology and the U.S. Department of Energy. Methods and activities to place the 105-N/109-N Reactor Complex into a condition of ISS are discussed in the *Removal Action Work Plan for 105-N/109-N Buildings Interim Safe Storage and Related Facilities* (RAWP) (DOE-RL 2009).

The implementation of best available radionuclide control technology for new construction or significant modifications, or as low as reasonably achievable control technology (ALARACT) for existing emission units or nonsignificant modifications, as appropriate, pursuant to *Washington Administrative Code* (WAC) 246-247-040(3) and (4), have been identified as applicable requirements. Air monitoring (WAC 246-247-075 [3] and [8]) is also an applicable requirement. This air monitoring plan (AMP) describes how the substantive portions of these requirements will be implemented for this removal action. Additional standards for controlling air emissions to the environment are addressed in the RAWP (DOE-RL 2009).

Updates to this AMP may be accomplished through the unit managers' meeting minutes. When the RAWP is updated, changes to this AMP will be incorporated into the revised RAWP.

The scope of this AMP addresses ISS work activities. After ISS work activities are completed, a separate document will be prepared to address follow on surveillance and maintenance of the interim enclosure.

2.0 PLANNED ACTIVITIES

A detailed discussion of deactivation, decontamination, decommissioning, and demolition (D4) planned activities appears in the main text of the RAWP (DOE-RL 2009) and the supporting air emissions calculation (WCH 2009).

The ISS activities include removal of most portions of the 105-N Reactor facility up to the shield walls that surround the reactor block and removal of most portions of the 109-N facility up to the shield walls around the steam generator cells, and construction of a safe storage enclosure over the remaining portions of both facilities. The reactor block, steam generators, process piping, and associated inventory will not be removed as part of this activity.

The D4 removal action work scope includes conducting surveillance activities; sampling to characterize the nature and extent of contamination; performing decontamination, deactivation, and demolition; excavating contaminated soil; treating waste (e.g., solidification) (as necessary) to meet waste acceptance criteria; storing, handling, loading, and transporting waste for disposal; and constructing a safe storage enclosure.

2.1 105-N FACILITY

Most portions of the 105-N facility outside of the reactor shield walls (Non-Zone I Areas) will undergo D4. These areas include most of the rooms and shops from the minus 16-ft elevation to the plus 28-ft elevation and large portions of the plus 40-ft and plus 60-ft elevation areas. This also includes the 105-N Fuel Storage Basin (FSB) discussed below and loadout facilities. Process piping within the safe storage enclosure will not be removed during ISS activities and therefore will not have the potential to emit.

2.1.1 105-N Fuel Storage Basin

Contamination within the FSB will be fixed in place by nonaggressive means (e.g., paint, fogging) in all accessible above-grade (as needed) and below-grade areas. Mechanized demolition will then demolish the above-grade structure providing access to below-grade areas of the FSB. Once access in below-grade areas is provided for cover blocks to be removed, fixative will be placed into the cubicles. Grout, or similar low-strength inert material, will then be added to the bottom 2.4 m (8 ft) of the FSB. Below-grade portions of the FSB will then be demolished with heavy equipment by breaking up the grout, and FSB walls and floors. Material will be size reduced to fit into Environmental Restoration Disposal Facility (ERDF) containers and meet the ERDF acceptance criteria. The demolition will utilize water sprays and water cannon misting to mitigate potential fugitive emissions.

2.1.2 Fission Product Trap

The inventory within the fission product trap (FPT) will be grouted to stabilize contamination. Water may be pumped out prior to grouting/stabilization activities. If removed, the water will be sampled and disposed of appropriately. The area may be removed as a monolith or mechanically sized reduced, and debris would be placed into ERDF containers for disposal.

2.1.3 C Elevator Pit

The C Elevator Pit inventory will be grouted and left in place. If removed, the water will be sampled and disposed of appropriately. Grout/stabilization will occur with water present (e.g., using grout that can cure underwater) to ensure that the contents of the pit remains covered.

2.1.4 3X Ball Recovery Area

The scope for this area may include removal and disposal of loose 3X balls located throughout the room's floor. Loose contamination throughout the room may either be fixed, captured using a high-efficiency particulate air (HEPA) vacuum, or may be left as loose contamination given it's location underneath the reactor block.

2.2 109-N HEAT EXCHANGER BUILDING

Most portions of the 109-N facility outside of the shield walls encompassing the steam generator cells and pipe gallery will undergo D4. This includes all of the rooms and shops from the minus 16-ft elevation to the plus 24-ft elevation areas, decontamination cell, external steam distribution piping, and subgrade cooling water distribution piping directly south of the facility. Contaminated below-grade structures and underlying soil will be removed and disposed, as needed. Uncontaminated below-grade structures may be stabilized in place. The pressurizer, steam generator, and associated piping along with the penthouse structure within the 109-N Building will not be removed.

2.3 GENERAL DECONTAMINATION, DEACTIVATION, AND DEMOLITION WORK ACTIVITIES

Assessment, decontamination, deactivation, and demolition will be conducted in portions of the 105-N and 109-N facilities. Assessment will consist of radiological surveys and sampling, characterization, and preparation of all engineering and safety documents and work packages to perform the field activities.

Decontamination methods may include removal of some contamination (e.g., wiping or use of HEPA-filtered vacuums). However, in general, physical removal of contaminants is not feasible or cost effective; therefore, contamination is "fixed" so that the contaminants remain attached to construction materials and are less likely to become airborne during subsequent demolition activities. Methods of fixing contaminants in place include use of a fixative through a variety of application methods including aerosol applicators, paint rollers, or a pressurized air paint-gun. The type of fixative used is dependent upon the specific needs of the project and safety considerations.

After decontamination processes are completed, deactivation will be performed, which includes dismantling facility components, piping, ducting, and equipment and removal for disposal. Deactivation includes removal of hazardous materials (lead, lights, ballasts, mercury, etc.). During deactivation, friable and most nonfriable asbestos-containing materials (ACMs) and presumed ACMs will be removed. The ACM typically consists of insulation for piping, floor tiles, cement asbestos board, etc. Vacuum cleaners equipped with HEPA air filters will be used to decontaminate personnel protective equipment (PPE) and tools that are used for asbestos removal. Glovebags or similar confinement methods may be used to control the spread of contamination while removing asbestos. HEPA-filtered exhausters may be used to collapse these bags for disposal after use. Dust-suppression techniques will be employed during demolition activities such as water sprays and water cannon misting to mitigate potential fugitive emissions.

After deactivation processes are completed, demolition will be performed. Demolition generally means large-scale facility deconstruction using heavy equipment (e.g., excavator with a hoe-ram, shears, concrete pulverizer), or other industrial methods. Demolition methods will be selected based on the structural elements to be demolished, remaining radionuclide contamination, location, and integrity of the facility structure. Dust-suppression techniques will be employed during demolition activities such as water sprays and water cannon misting to mitigate potential fugitive emissions.

Any residual contamination in soils removed during D4 of structures has been accounted for in the assumed inventory for that structure. If extensive contamination is found, remediation will be deferred to the field remediation project with regulatory approval. An additional total effective dose equivalent (TEDE) calculation would be needed to address the additional inventory and these associated activities.

Temporary enclosures and HEPA-filtered exhausters may be used to control the spread of contamination.

Decontamination necessary to allow removal of demolition equipment from contamination areas will be accomplished using standard industry practices and best management practices. Gross equipment decontamination methods will be employed to remove loose contamination within the contamination area. Best management practices for gross cleaning and/or decontamination of heavy equipment and vehicles consist of using wipes and nonhazardous materials to remove loose contamination. More aggressive decontamination methods (such as grinding or wet grit blasting) may be used for decontamination if the other methods are ineffective.

3.0 AIRBORNE SOURCE INFORMATION

A summary of the airborne source information from the air emission calculation (WCH 2009) is presented in the following subsections. Radionuclide inventories within the 105-N/109-N facilities consist of the following areas:

- Fuel storage basin
- Fission product trap
- C Elevator Pit
- Non-Zone 1 Areas
- Ball 3X Recovery Area.

All activities are assumed to be performed over a 2 year period.

3.1 PTE FROM THE 105-N FUEL STORAGE BASIN

The 105-N FSB inventory is broken down into four different material forms. The PTE for these four material forms will be discussed below in the following subsections:

- Contaminated debris
- Water
- Sediment
- Walls and floors.

3.1.1 PTE for FSB Debris

All of the debris resides on the floor of the FSB and cask pit, which will be grouted. The form of debris is neutron irradiated hardware. A release fraction of 1E-06 will be assigned to the debris because inventory is in the solid form and will remain in the solid form even during grouted material removal in the FSB. Table B-1 shows the PTE from debris within the FSB.

3.1.2 PTE for FSB Water

The FSB water inventory is assumed to be evaporated and in the form of smearable contamination that resides on the floor of the FSB. Contamination within the FSB will be fixed followed by application of grout to the bottom 2.4 m (8 ft) of the FSB. It is assumed that the inventory will be solidified within the grout, but some material may be released during demolition of the FSB. The entire inventory is conservatively assumed to be particulate and assigned a release fraction of 1E-03.

Tritium (H-3) was primarily in the form of tritiated water and is assumed to be adhered to the concrete surfaces. Although tritium could be modeled with a release fraction consistent with the remainder of the inventory (assigned an release fraction of 1E-03), one-half of the inventory will be assigned a release fraction of 1 (consistent with a gaseous form) and one-half of the inventory assigned a release fraction consistent with the remainder of the inventory (a release fraction of 1E-03).

Table B-1 shows the PTE from water within the FSB.

3.1.3 PTE for FSB Sediment

The FSB sediment inventory resides throughout the floor of the FSB. Contamination within the FSB will be fixed followed by application of grout to the bottom 2.4 m (8 ft) of the FSB. It is assumed that the inventory will be solidified within the grout, but some material may be released during demolition of the FSB. The entire inventory is conservatively assumed to be particulate and assigned a release fraction of 1E-03. Table B-1 shows the PTE from sediment within the FSB.

3.1.4 PTE for FSB Walls and Floors

The inventory within the FSB walls and floor resides within the matrix of the floors and walls throughout of the FSB. Most of this inventory is anticipated to reside in floor and lower portions of the FSB where contaminated water/sediment was absorbed by semiporous concrete. Contamination within the FSB will be fixed followed by application of grout to the bottom 2.4 m (8 ft) of the FSB. It is assumed that some of the wall and floor inventory may be released during demolition of the FSB. The entire inventory is conservatively assumed to be particulate and assigned a release fraction of 1E-03.

Tritium (H-3) is primarily in the form of tritiated water that was absorbed into the walls and floor. Although tritium could be modeled with a release fraction consistent with the remainder of the inventory (assigned an release fraction of 1E-03), one-half of the inventory will be assigned a release fraction of 1 (consistent with a gaseous form) and one-half of the inventory will be assigned a release fraction consistent with the remainder of the inventory (a release fraction of 1E-03).

Table B-1 shows the PTE from inventory within the walls and floors of the FSB.

3.2 PTE FOR FISSION PRODUCT TRAP

The inventory within the FPT will be grouted to stabilize contamination. Water may be pumped out prior to grouting/stabilization activities. For contaminated water removal, stabilization/grouting activities, demolition, and load out, a release fraction of 1E-03 will be assigned. The area may be removed as a monolith or mechanically sized reduced and debris would be placed into ERDF containers for disposal. Table B-1 shows the PTE from the FPT.

Table B-1. 105-N and 109-N PTE/TEDE Summary. (2 Pages)

	Nuclide	Potential to Emit (Ci/yr)									Total Effective Dose Equivalent (TEDE) / year (mrem/yr)
		FSB Activities				Fission Product Trap	C Elevator Pit	Non-Zone 1 Areas	3X Ball Recovery Area	Total (PTE)	
		Debris	Water	Sediment	Walls and Floor						
1	Am-241	1.50E-09	7.35E-09	6.85E-04	3.60E-03	1.73E-04	8.26E-05	4.68E-07	1.64E-08	4.54E-03	1.61E-02
2	Am-243			1.26E-10	6.60E-10		1.18E-11	2.10E-12		8.00E-10	0.00E+00
3	Ba-137m2[a]	7.80E-08	1.89E-05	2.25E-03	3.09E-02	1.82E-03	4.91E-04	6.25E-05	1.33E-06	3.55E-02	9.51E-05
4	C-14	3.63E-07	4.63E-07		4.69E-04		4.19E-06		4.49E-04	9.23E-04	7.72E-07
5	Ca-41								4.14E-08	4.14E-08	4.74E-11
6	Cl-36								3.10E-06	3.10E-06	1.61E-06
7	Cm-242		9.55E-16		9.65E-13		2.07E-13			1.17E-12	0.00E+00
8	Cm-243			6.15E-05	3.24E-04		8.55E-06	7.99E-07	3.78E-07	3.95E-04	1.06E-03
9	Cm-244		1.41E-10		1.42E-07		1.38E-09	6.58E-07		8.02E-07	1.81E-06
1	Co-58		2.88E-19		2.90E-16		3.87E-15			4.16E-15	0.00E+00
1	Co-60	1.17E-05	1.07E-08	4.54E-04	2.39E-03	2.59E-03	7.84E-05	5.51E-04	5.05E-04	6.58E-03	1.93E-04
1	Cs-134		3.17E-09	4.43E-07	5.50E-06	2.23E-07	1.73E-07	2.93E-08		6.37E-06	8.20E-07
1	Cs-137	8.25E-08	1.99E-05	2.38E-03	3.27E-02	1.93E-03	5.19E-04	6.61E-05	1.40E-06	3.76E-02	3.76E-03
1	Eu-152		4.79E-08		4.86E-05		4.84E-07		7.79E-05	1.27E-04	1.14E-06
1	Eu-154	6.10E-09	3.08E-09	3.54E-05	1.89E-04	9.10E-06	5.53E-06	1.62E-04	1.01E-02	1.05E-02	1.11E-04
1	Eu-155	4.53E-10	1.32E-08	1.37E-05	8.55E-05	9.30E-06	2.57E-06	3.26E-05	1.94E-03	2.08E-03	1.96E-06
1	Fe-55	8.85E-06	1.87E-09		1.90E-06		2.87E-08			1.08E-05	4.56E-09
1	H-3		1.57E-01		1.59E+02		3.19E+00		3.60E+00	1.66E+02	4.65E-03
1	I-129		1.78E-08		1.80E-05		1.61E-07	1.75E-06		1.99E-05	1.33E-06
2	Mn-54	7.30E-11								7.30E-11	0.00E+00
2	Nb-93m	2.84E-08						1.44E-04		1.44E-04	1.35E-08
2	Nb-94								6.19E-08	6.19E-08	5.28E-10
2	Ni-59	9.60E-06								9.60E-06	2.18E-09
2	Ni-63	8.90E-08	2.10E-07		2.13E-04		1.93E-06		5.16E-04	7.30E-04	4.08E-07
2	Np-237	2.94E-15	5.55E-10	1.26E-09	5.65E-07	4.03E-10	5.11E-09	2.70E-08	4.29E-07	1.03E-06	2.01E-06
2	Pu-238	3.82E-10	2.52E-08	7.80E-05	4.36E-04	3.79E-05	1.07E-05	2.03E-07		5.62E-04	2.21E-03
2	Pu-239	2.11E-09	1.96E-07	4.84E-04	2.75E-03	3.24E-04	6.58E-05	3.23E-07	8.21E-06	3.63E-03	1.55E-02
2	Pu-241	2.54E-08		1.75E-02	9.15E-02	9.65E-04	2.55E-03	8.50E-06	5.10E-05	1.13E-01	8.66E-03
2	Pu-242			9.70E-07	5.10E-06		1.28E-07	2.70E-08		6.23E-06	2.52E-05
3	Ra-226	2.09E-22	6.25E-10	6.65E-05	3.50E-04	2.32E-14	8.81E-06	2.18E-19		4.25E-04	2.16E-04
3	Ru-106					4.13E-08		2.04E-09		4.33E-08	1.70E-10
3	Sb-125	2.17E-11	1.57E-08	2.76E-06	3.04E-05		8.55E-07	6.72E-07		3.47E-05	9.10E-08

Table B-1. 105-N and 109-N PTE/TEDE Summary. (2 Pages)

	Nuclide	Potential to Emit (Ci/yr)									Total Effective Dose Equivalent (TEDE) / year (mrem/yr)
		FSB Activities				Fission Product Trap	C Elevator Pit	Non-Zone 1 Areas	3X Ball Recovery Area	Total (PTE)	
		Debris	Water	Sediment	Walls and Floor						
3	Sr-90	1.88E-07	9.00E-05	1.94E-03	1.02E-01	1.21E-03	1.13E-03	3.25E-06	3.48E-05	1.06E-01	1.81E-02
3	Tc-99		5.05E-08	1.15E-05	1.11E-04		1.97E-06			1.24E-04	3.71E-06
3	Te-125m	5.30E-12	3.84E-09	6.75E-07	7.45E-06					8.13E-06	1.15E-08
3	Th-232		1.30E-30	4.43E-17	2.33E-16		4.05E-18	1.63E-23		2.81E-16	0.00E+00
3	U-234	7.40E-15	4.88E-13	1.32E-06	6.90E-06	2.24E-07	1.74E-07	4.94E-12		8.61E-06	2.66E-06
3	U-235	1.39E-17	1.29E-15	3.16E-08	1.66E-07	4.05E-08	4.18E-09	1.41E-08	1.57E-07	4.13E-07	1.14E-07
3	U-235m3[b]	2.11E-09	1.96E-07	4.84E-04	2.75E-03					3.23E-03	0.00E+00
4	U-236		1.16E-20	1.35E-07	7.10E-07		1.79E-08	7.96E-14		8.63E-07	2.46E-07
4	U-238			6.05E-07	3.19E-06	1.82E-07	8.00E-08	3.49E-17	1.30E-07	4.18E-06	1.07E-06
4	Y-901[ac]	1.88E-07	9.00E-05	1.94E-03	1.02E-01	1.21E-03	1.13E-03	3.25E-06	4.86E-07	1.06E-01	6.68E-05
4	Zr-93	9.30E-09								9.30E-09	7.93E-12
											7.08E-02

(a) Ba-137m, a daughter product of Cs-137, is assumed to be 0.946 of Cs-137 inventory.
(b) U-235m in not included in the CAP88 nuclide library, therefore was not included as an input to the CAP88 code.
(c) Y-90, a daughter product of Sr-90, is assumed to be in equal to Sr-90.

3.3 PTE FOR C ELEVATOR PIT

The inventory within the C Elevator Pit will be grouted to stabilize contamination and left in place. For the contaminated water inventory, a release fraction of 1E-03 will be assigned. For the remaining sediment, grout will be applied while under water. It is assumed that 5% of the sediment inventory may be released during grouting and will have a release fraction of 1E-03. The remaining sediment will not have any potential to be released.

Tritium contained in the water will be modeled with a release fraction of 1. No tritium is contained in the sediment.

Table B-1 shows the PTE from the C Elevator Pit.

3.4 PTE FOR NON-ZONE 1 AREAS

The inventory within Non-Zone 1 Areas is composed of areas of fixed and loose/smearable contamination. The use of a HEPA-ventilated vacuum may be used in Non-Zone 1 Areas on a limited basis; therefore, 1% of the inventory will be assigned a release fraction of 1. Although the material form will remain as a particulate, a release fraction of 1 is applied to the HEPA vacuum inventory assuming no controls (i.e., loss of HEPA filtration) resulting in all of the particulate material being release into the air, consistent with Washington State Department of Health guidance captured in *Radioactive Air Emissions Notice of Construction for HEPA Filtered Vacuum Radioactive Air Emission Units* (DOE 1999). The remaining 99% of the inventory is assumed to be in the form of loose particulate and assigned a release fraction of 1E-03. Table B-1 shows the PTE from inventory within Non-Zone 1 Areas.

3.5 PTE FOR BALL 3X RECOVERY AREA

The radiological inventory is composed of inventory within the neutron irradiated 3X balls and smearable contamination through the 3X Ball Recovery Room. Most of the inventory is within the 3X balls that are neutron irradiated solid spheres. For the 3X balls, 80% of the inventory will be assigned a release fraction of 1E-06 and 20% assigned a release fraction of 1E-03. Although tritium could be modeled with a release fraction consistent with the remainder of the solids inventory (80% assigned a release fraction of 1E-06 and 20% a release fraction of 1E-03), one-half of the inventory will be assigned a release fraction of 1 (consistent with a gaseous form) and one-half of the inventory will be assigned a release fraction of 1E-03.

The use of a HEPA-ventilated vacuum may be used to gather smearable contamination; therefore, conservatively 100% of the removable inventory will be assigned a release fraction of 1 (including tritium).

Table B-1 shows the PTE from inventory within the 3X Ball Recovery Area.

3.6 TOTAL PTE AND TEDE SUMMARY FOR THE 105-N/109-N FACILITY

The total PTE for all ISS activities is calculated in Table B-1 and also shows the TEDE contribution from each nuclide.

The CAP-88-PC, Version 3.0, model was used to determine the TEDE (or annual unabated offsite dose) to the maximally exposed individual (MEI). The PTE (Ci/yr) was used for the input for the computer model, and the model generated the annual unabated dose. The distance to the MEI used in the model was 9,416 m west northwest at the site boundary. The maximum TEDE to the MEI from D4 activities for any one year is estimated at 7.08E-02 mrem/yr.

4.0 AS LOW AS REASONABLY ACHIEVABLE CONTROL TECHNOLOGY

The D4 activities have the potential to release radioactive emissions to the atmosphere. Implementing ALARACT for these radioactive emissions has been identified as an applicable or relevant and appropriate requirement.

The use of wiping or applying fixatives and grouting is an as low as reasonably achievable control that has been accepted as ALRACT for fugitive particulate radionuclide air emissions, particularly when the potential offsite dose is low. Glovebags, gloveboxes, and enclosures may also be used to reduce potential emissions. For vacuuming and the use of portable ventilation units, HEPA filters are used to collect generated dust. The use of HEPA filters has been generally accepted as ALARACT, and their use is encouraged whenever practical during removal activities. HEPA filters shall have efficiency testing performed upon installation and on an annual basis thereafter and must be demonstrated to have a 99.95% removal efficiency. Because structure demolition may be a source of radioactive fugitive emissions, dust suppressants (e.g., water and fixatives), and grout or similar strength material will be used and are considered ALARACT for demolition. When using water, quantities used will be minimized to prevent water accumulation, puddles, and runoff within the area where the water is being used.

The following provides additional details concerning the implementation of controls:

Water will be applied as required during demolition, excavation, container loading, and backfilling processes to minimize airborne releases.

Fixatives will be applied to any contaminated debris or soils (excluding material that has been wrapped to preclude release or contain no removable contamination) that are being stockpiled or will be inactive for more than 24 hours.

Fixatives will be applied to contaminated soils and debris that will be inactive less than 24 hours, excluding items that have been wrapped. However, if a soil fixative has already been applied and the soil and/or debris will remain undisturbed, further uses of fixatives will not be reapplied, unless needed. The fixatives or other controls will not be applied when the contaminated soils and/or debris are frozen or it is raining, snowing, or other freezing precipitation is falling at the end of work operations.

Haul trucks transporting bulk materials, with removable contaminants, will be covered to contain the materials while in transit to the ERDF.

5.0 MONITORING

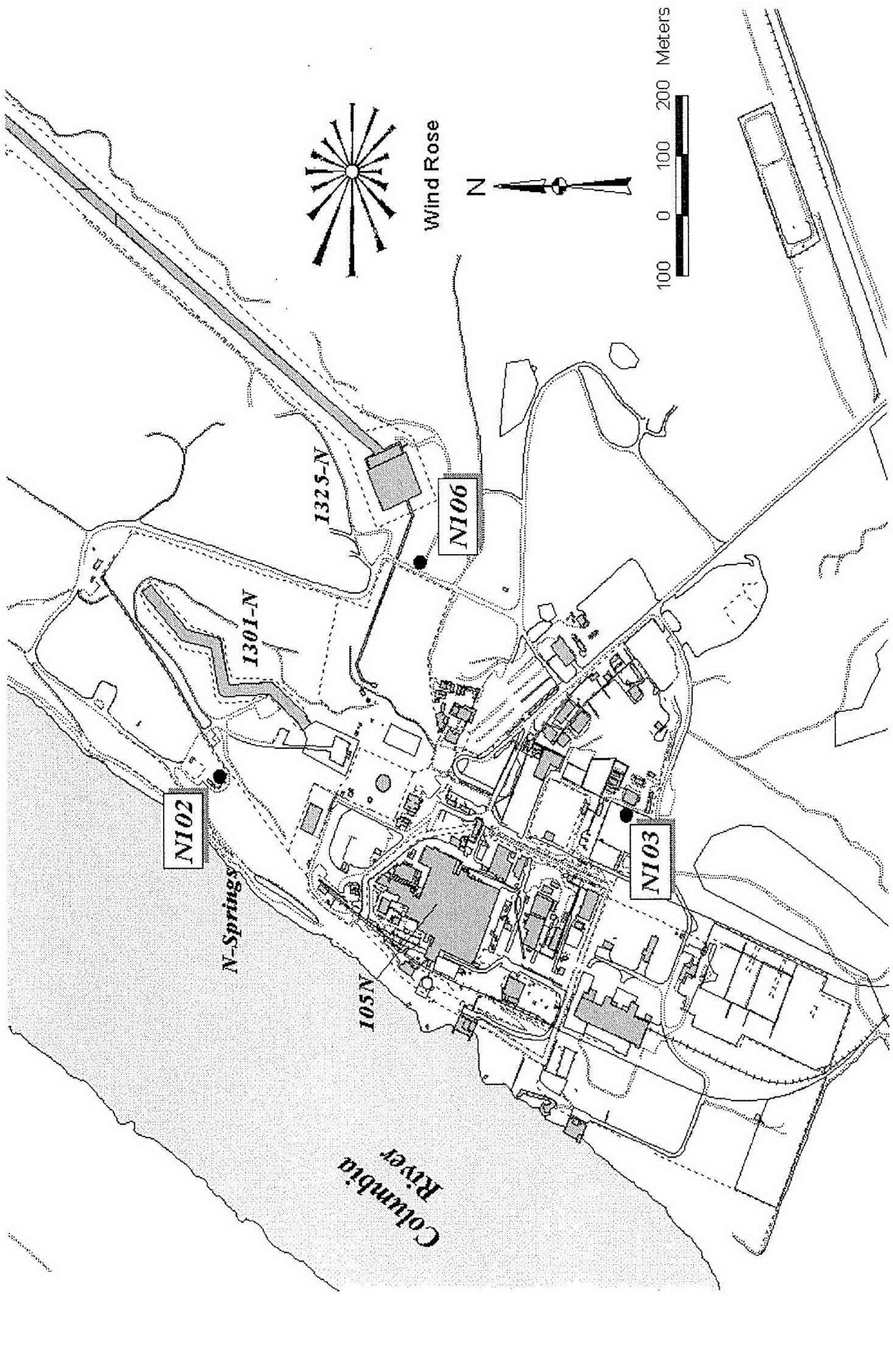
Existing 100-N Area air monitors (i.e., N102, N103, and N106) will be used to monitor emissions from the removal action activities. The locations of the near-facility air monitors are shown in Figure B-1.

The operation of these monitors will follow the protocol established for near-facility monitors on the Hanford Site. The air samples will be changed every 2 weeks and analyzed for total alpha and total beta. The samples will be composited semiannually and analyzed for gamma energy-emitting radionuclides, strontium-90, isotopic uranium, isotopic plutonium. As part of the site-wide evaluation of near-field monitoring (NFM) data, the electronic release summary (ERS) database compares NFM composite air sample results to 10% of the Table 2 values, Appendix E, 40 CFR 61. The database identifies results that exceed these values. Results from the downwind air monitors identified in this plan that are above these values will be investigated and the adequacy of the controls evaluated as appropriate.

The data results will then be entered into the Automated Bar Coding of Air Samples at Hanford database for record keeping and reporting. The data from these monitors will be included in the annual reports prepared for the Hanford Site.

Exhaust points from HEPA filters will be monitored on a routine basis for potential radionuclide releases and results recorded (e.g., post-survey results negative). Any positive survey results will require appropriate maintenance on the facility, exhauster, or vacuum to ensure that continued releases do not occur. Records of routine monitoring and necessary maintenance will be provided to Washington State Department of Ecology staff upon request.

Figure B-1. Air Monitors.



6.0 REFERENCES

40 CFR 61, "National Emission Standards for Hazardous Air Pollutants," *Code of Federal Regulations,* as amended.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. 9601, et seq.

DOE-RL, 2009, *Removal Action Work Plan for 105-N/109-N Buildings Interim Safe Storage and Related Facilities*, DOE/RL-2005-43, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1999, *Radioactive Air Emissions Notice of Construction for HEPA Filtered Vacuum Radioactive Air Emission* Units, DOE/RL-97-50, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington

Ecology, 2005, *105-N Reactor Building and 109-N Heat-Exchanger Building Action Memorandum*, LTR 0500979, from Michael A. Wilson to Keith A. Klein, U.S. Department of Energy, Richland Operations Office, dated February 22, 2005, Washington State Department of Ecology, Olympia, Washington.

WAC 246-247, "Radiation Protection – Air Emissions," *Washington Administrative Code*, as amended.

WCH, 2009, *TEDE Calculation for ISS and D4 of the 105-N / 109-N Facility,* 0100N-CA-V0082, Rev. 3, Washington Closure Hanford, Richland, Washington.

APPENDIX C

FACILITY STATUS CHANGE FORM

APPENDIX C

FACILITY STATUS CHANGE FORM

1.0 INTRODUCTION

The purpose of the form is to document agreement among the parties on the status of facility deactivation, decontamination, decommissioning, and demolition (D4) operations and the disposition of underlying soil in accordance with the applicable regulatory decision documents. The form provides the following information to document either completion or deferral of a removal action:

- Quantitative information about the facility demolition
- A justification for completion that includes a list of contaminants of concern for the facility, a synopsis of the data collected, and a listing of the samples collected (and associated sample numbers)
- Photographs of the demolition activity
- Document that the wastes have all been shipped to the appropriate disposal facility
- Provide for U.S. Department of Energy (DOE) and regulator concurrence to the completion, and
- Provide for a standard distribution of the form, including the Administrative Record.

A copy of the form is provided in Table C-1.

2.0 FORM COMPLETION INSTRUCTIONS

2.1 TOP PORTION

The top portion of the form should be filled out to identify the facility and under which removal action the completion applies.

2.2 SECTION 1: FACILITY STATUS

Facility Status

The appropriate block will be marked to identify whether the facility removal action is complete or whether remaining actions are being deferred.

Description of Completed Activities and Current Conditions:

This portion will identify the following:

1. Whether the facility removal actions were performed in accordance with the applicable action memorandum

2. Whether all hazardous material was removed from the facility prior to demolition

3. When the demolition was completed and whether the foundation and any other sub-surface structures were removed, and

4. Document final disposition of the demolition debris.

Description of Deferral (as applicable):

This portion will be completed when deferring the below-grade portions of the facility to be performed with the remedial action. A justification for the deferral will be provided (e.g., underlying waste sites, active utilities).

2.3 SECTION 2: UNDERLYING SOIL STATUS

Underlying Soil Status

The appropriate block will be marked to identify the relationship between the facility and waste sites.

Description of Current/As-Left Condition:

This portion of the form will identify the following:

1. Whether the underlying soils were a documented waste site;
2. If soil contamination was found as a result of the removal action;
3. Whether adjacent documented waste sites were affected; and
4. A description of the method that will be used to backfill the excavated area.

Identification of Documented Waste Site(s) or Nature of Potential Waste Site Discovery (as applicable):

This portion will describe any waste sites or potential waste sites that were encountered as a result of the removal action.

2.4 SECTION 3: LIST OF ATTACHMENTS

Supplemental information includes the following:

1. Facility information: Building history, characterization information including a summary of the collected sample data, and a description of the D4 activities that were performed
2. Underlying Soil: An assessment of the contaminants of concern that could be potentially released during facility demolition, and the final radiological survey
3. Evaluation of Related/Adjacent Waste Sites: This will include an assessment of the related/adjacent waste and how they were affected by the removal action, and
4. Project photographs.

Table C-1. Facility Status Change Form.

Date Submitted: **Originator:** **Phone:**	**Area:** **Facility ID:** **Action Memorandum:**	**Control #:**
This form documents agreement among the parties listed below on the status of facility D4 operations and the disposition of underlying soil in accordance with the applicable regulatory decision documents.		
Section 1: Facility Status ☐ All D4 operations required by action memo complete. ☐ D4 operations required by action memo partially complete, remaining operations deferred. **Description of Completed Activities and Current Conditions:** **Description of Deferral (as applicable):**		

Table C-1. Facility Status Change Form.

Date Submitted: **Originator:** **Phone:**	**Area:** **Facility ID:** **Action Memorandum:**	**Control #:**

This form documents agreement among the parties listed below on the status of facility D4 operations and the disposition of underlying soil in accordance with the applicable regulatory decision documents.

Section 2: Underlying Soil Status

- ☐ No waste site(s) present. No additional actions anticipated.
- ☐ Documented waste site(s) present. Cleanup and closeout to be addressed under Record of Decision.
- ☐ Potential waste site discovered during D4 operations. Waste site identification number <to be> assigned. Cleanup and closeout to be addressed under Record of Decision.

Description of Current/As-Left Conditions:

Identification of Documented Waste Site(s) or Nature of Potential Waste Site Discovery (as applicable):

Section 3: List of Attachments

______________________________ ________________
DOE-RL **Date**

______________________________ ________________
Lead Regulator ☐ **EPA** ☐ **Ecology** **Date**

DISTRIBUTION

U.S. Department of Energy
Richland Operations Office

M. S. French	A3-04
R. F. Guercia	A3-04
J. J. Waring	L1-02

Washington Closure Hanford

M. E. Allen	X5-50
J. M. Carranco	X5-50
R. L. Cathel	X5-50
J. D. Delaney	X5-50
S. M. Hamblin	X5-50
K. J. Koegler	L7-11
R. J. Landon	H4-21
M. A. Mihalic	X5-50
B. D. Smith	L7-11
R. A. Trevino	X5-50

Document Control	H4-11
DOE-RL Public Reading Room	H2-53
Hanford Technical Library	P8-55
Project Files	X5-50